THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXVI. No. 646.] LONDON, SEPTEMBER 28, 1875. [27TH YEAR.] Price 6d.

RAMSAY'S NEWCASTLE CANNEL

COAL. Analysis—10,000 cubic feet of gas per ton of coal; 26-candle gas; 13¼ cwt. coke per ton of coal.

The London Exhibition in 1851 was lighted with gas made from Ramsay's Cannel.

RAMSAY'S PATENT CONDENSED COKE.
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GAS-RETORTS, introduced 1828. FIRE-BRICK WORKS, established 1804. FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.

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These Paints are now used in 100 Country Gas-Works, and by all (but one) of the London Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. They will cover far effectually. Also used by the Admiralty, War Office, Railway Companies, Founders, &c.

They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations.

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RETORTS SET, AND GUARANTEED TO BURN OFF A CERTAIN AMOUNT OF COAL, OR ELSE NO MONEY TAKEN FOR THE CONTRACT.

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LONDON, 1862. CLASS X.
LONDON, 1862. CLASS XXXI.
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IMPROVED DRY GAS-METERS,

WARRANTED TO MEASURE CORRECTLY, AND NOT TO VARY.

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SILVER MEDAL, PARIS EXHIBITION, 1867.

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OF THE

FRICTIONLESS DRY GAS-METERS,

Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

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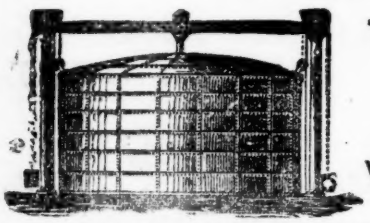

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STATION & CONSUMERS WET OR DRY METERS, STREET & SERVICE MAINS, LAMP COLUMNS & BRACKETS, & WROUGHT-IRON TUBES AND FITTINGS; WROUGHT-IRON ROOFS FOR ANY SIZE OF BUILDINGS.

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AND PATENTEES OF THE IMPROVED COMBINED CONDENSING AND PURIFYING APPARATUS SO EMINENTLY ADAPTED FOR EXPORTATION.

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Wharf No. 4, inside Great Northern Goods Station, King's Cross, N.;

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Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

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GLOBE TUBE-WORKS, WEDNESBURY; & VICTORIA TUBE-WORKS, GREAT BRIDGE, STAFFORDSHIRE,

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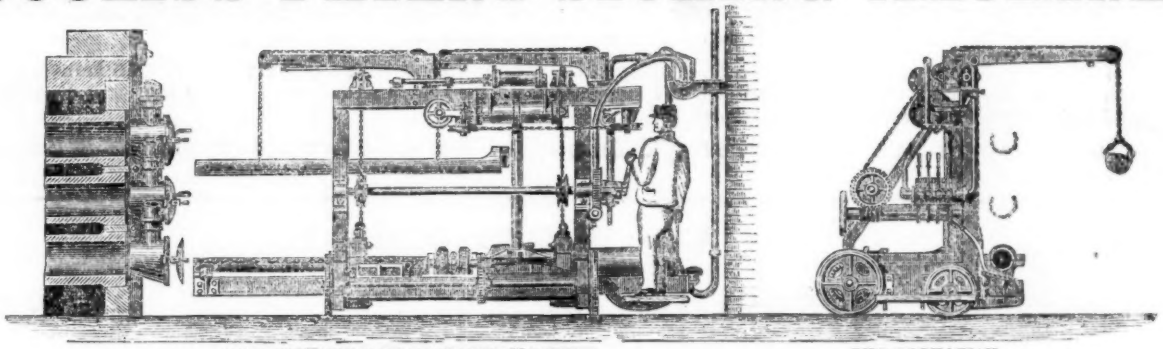
CHANDELIERS, &c., GAS-FITTERS' TOOLS, GAS TONGS, STOCKS, TAPS, DIES, &c., &c.,
HANDRAIL TUBINGS, IRON AND BRASS, PLAIN OR TWISTED,
TELEGRAPH TUBES OR POLES, &c., &c.

FOULIS'S PATENT STOKING MACHINE.



SIDE ELEVATION OF CHARGING MACHINE. END ELEVATION.

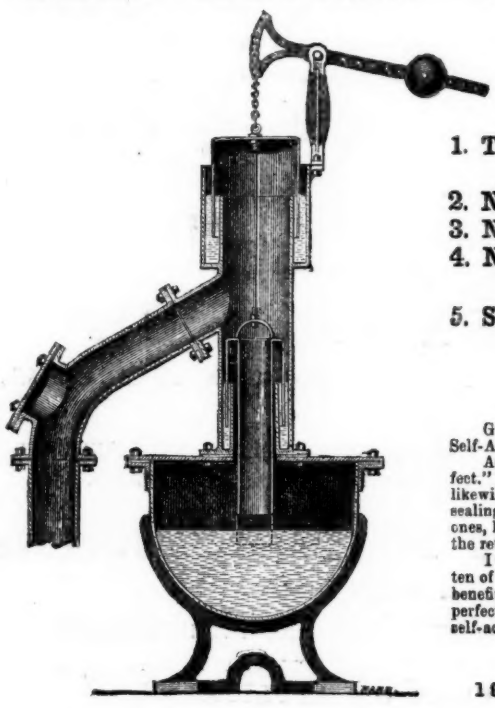
(*The Drawing Machine will be Illustrated in next week's Advertisement.*)

Makers: **TANGYE BROTHERS and HOLMAN, London and Birmingham; ADAM WOODWARD and SON, Manchester; ROBERT LAIDLAW and SON, Glasgow; MASCHINENBAU-ACTIEN-GESELLSCHAFT HUMBOLDT, Kalk bei Deutz;**
Or all particulars may be had from **JAMES WOTHERSPOON, 31, St. Vincent Place, Glasgow.**

SELF-ACTING REMOVABLE DIP-PIPE,

PATENTED BY

CHANDLER & STEVENSON.



ADVANTAGES.

1. There is no pressure on the Retorts.
2. No deposit of Carbon.
3. No scurfing is required.
4. Never a choked Ascension-Pipe.
5. Saves Fuel and Wear and Tear.
6. Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
7. Is never out of order.
8. Requires no attention.
9. Is perfectly automatic in its action.

TESTIMONIAL.

Metropolitan District Asylum, Caterham, Surrey, Dec. 14, 1874.

MESSRS. CHANDLER AND STEVENSON.

GENTLEMEN,—I have much pleasure in bearing testimony to the complete working of your "Patent Self-Acting Dip-Pipes," which have now been in constant operation over three months.

As regards the action of the apparatus, I can describe it no better than by calling it "simply perfect." Immediately the retort is charged and the lid secured, the small holder rises, which lifts the Dip; likewise the instant the gas is permitted to escape at the mouthpiece the holder falls, thus perfectly sealing the Dip. I am fully convinced of the superiority of these Self-Acting Dips over Non Self-Acting ones, having experienced the fact that stokers do occasionally neglect to unseal the Dip after charging the retort, thereby causing a waste or loss.

I feel that it is quite unnecessary for me to say more on the subject, excepting that, having had ten of Messrs. Chandler's Dip-Pipes in use more than one year, and having experienced the great benefits derived thereby, inasmuch as the yield of gas from the coal is greatly increased, and the retorts perfectly free from carbon and other advantages, and seeing that the same Dip has been made perfectly self-acting by the second patent, I feel convinced that this is the right thing.—Yours obediently,

W. CRICKMAY, Resident Engineer.

For terms of use and cost, apply to Mr. G. W. STEVENSON,

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KING'S ROAD, LONDON, N.W.,

OFFICE: 9, VICTORIA CHAMBERS, WESTMINSTER, S.W.,

MANUFACTURERS OF

"WET" & "DRY" GAS-METERS IN IRON & TIN-PLATE CASES,

STATION-METERS AND GOVERNORS, STREET-LAMP METERS, BOXES, AND REGULATORS FOR THE AVERAGE METER SYSTEM.

TO GAS COMPANIES, ENGINEERS, &c.

These Works are in full operation, and it will be the aim of the New Company not only to keep up the excellent workmanship of their predecessors, but, by the introduction of special machinery, to manufacture **Meters of a higher standard than is usually given, without increasing the cost.**

Special attention is invited to the Compensating Wet Gas-Meter of De Castro and Burton, which is now becoming so generally adopted, and is more simple in construction than any other Compensating or Ordinary Wet Meter. There is but one centre of friction to be overcome by the gas. By its self-adjusting principle it maintains an unvarying water-line; and the reservoir contains sufficient water to supply the Meter for twelve months without attention. It is unaffected by "tilting," and cannot be "flooded" by any pressure.

The Company also manufacture Dry Meters upon the most improved principle, and all their Meters being made to standard gauges, the most accurate measurement is obtained.

Attention is also called to their Dry Meters in Wood Cases, as used by some of the London Gas Companies. These Cases are a great preservation to Tin-plate Meters, especially in seaport towns, where the air is impregnated with salt; they are also particularly suited for export.

The Company repair or convert every description of Wet Gas-Meters to De Castro and Burton's Patent.

TO GAS AND WATER COMPANIES

AND

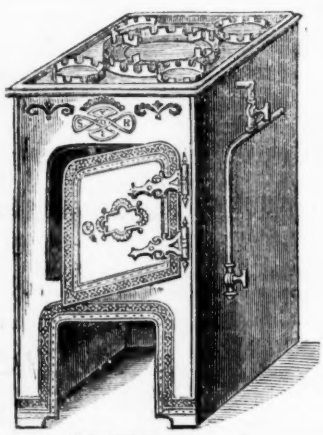
MUNICIPAL AUTHORITIES SUPPLYING WATER OR GAS.

CONSPIRACY AND PROTECTION OF PROPERTY ACT, 1875.

It is required, under a **Penalty of FIVE POUNDS**, that a **Printed Copy** of the **4th Section** of the above Act shall be posted up at all Gas and Water Works in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed Copies of the Section, in large type, on broad sheets, may be had at the Office of this JOURNAL. Price, per post, 2s. per dozen, or 10s. 6d. per 100.

THE ACT CAME INTO OPERATION ON SEPT. 1, 1875, AND EXTENDS TO SCOTLAND AND IRELAND.



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15 in. wide, 27 in. high, with Dripping Pan, Gridiron, and Terra Cotta Radiator. Price £2 10s.

No. 77.
18 in. wide, 36 in. high.
Hot Plate 24 in. by 21 in. Price £5.

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CUMBERLAND WORKS, VITTORIA ST., BIRMINGHAM,

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GAS APPARATUS

FOR CULINARY AND DOMESTIC USE.

FOR EXCELLENCE OF DESIGN AND FINISH, COMBINED WITH GENERAL UTILITY AND EFFICIENCY, OUR GOODS ARE UNRIVALLED.

THE NEW REGISTERED "PARAGON" BOILING-STOVE

(From 2s. 3d. to 10s.)

IS THE MOST PERFECT ARTICLE OF THE KIND YET INTRODUCED.

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NEW GAS-WORKS erected complete. Plans and Estimates furnished. MAINS, METERS, SERVICES, LAMPS, &c., adapted for Towns of any size. Gas Companies advised on Improvements, Extensions, and Alterations of Works.

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They beg special attention to the excellence and superiority of their WET and DRY METERS, several thousand being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

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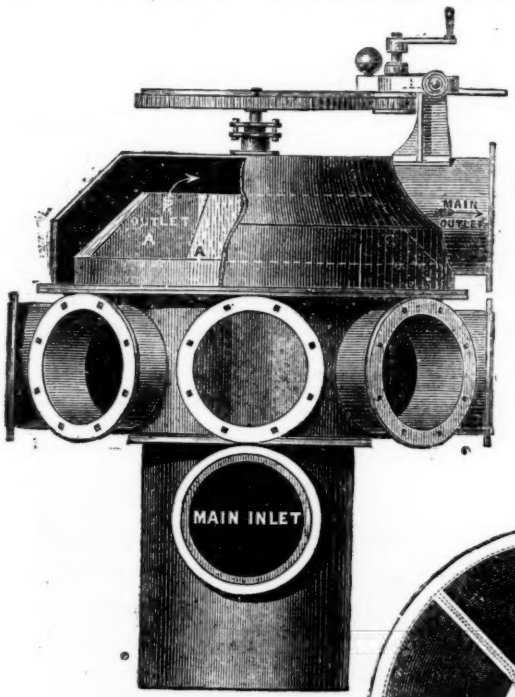
An extensive variety of Choice Designs in CHANDELIERS, PENDANTS, BRACKETS, STAR and SUN LIGHTS, MEDIÆVAL FITTINGS for CHURCHES, &c.

PATTERN-BOOKS and PRICE LISTS furnished.

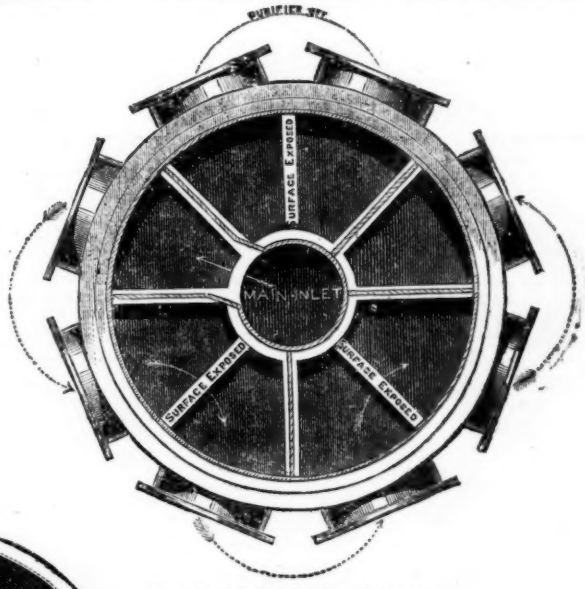
☞ PLEASE NOTE THE ADDRESS—

GAS ENGINEERING WORKS, COMMERCIAL ROAD, EXETER.

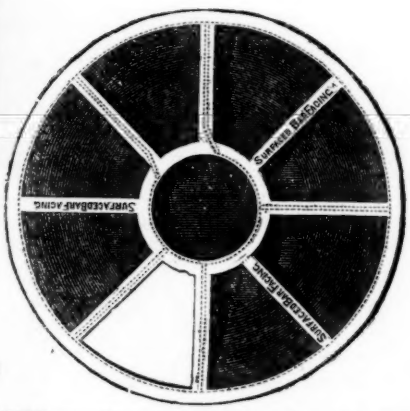
C. & W. WALKERS' PATENT CENTRE-VALVES.



Elevation of the Centre-Valve for four Purifiers. The safety cover is shown broken, to enable the Valve itself, which is inside, to be seen.



Plan of the Body, showing the Valve lying in it, with three of the facings, which were formerly exposed to settlements of dirt, carbon, naphthaline, &c., but which are now always covered by the surfaced bar-facings of the Valve. (See below.)



Plan of the Valve, or upper portion, showing the surfaced bar-facings referred to above.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A very considerable improvement and saving is effected in the cost of the connecting-pipes.

FOUR-WAY CENTRE-VALVES FORMING INLET, OUTLET, AND BYE-PASS.

MIDLAND IRON-WORKS, DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

THOMAS LAMBERT & SONS
MANUFACTURE EVERY DESCRIPTION OF
GAS AND WATER FITTINGS;
ALSO,
WROUGHT-IRON TUBES & FITTINGS.
SHORT STREET, LAMBETH, LONDON.

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FIRE CLAY and BRICK WORKS,
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GAS-RETORTS, GLASS-HOUSE FURNACE,
BLAST-FURNACE, & TANK BRICKS, LUMPS, TILES,
And Every Description of Best Fire-Bricks.

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GAS PURIFIERS & SCRUBBERS.

WORKS:
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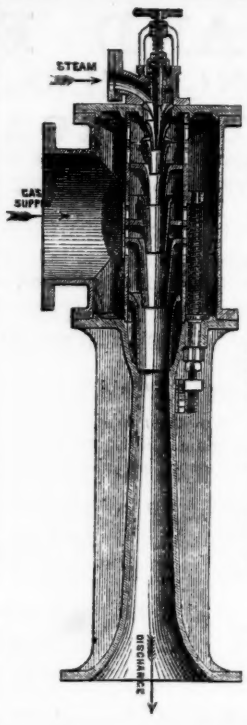
PREVENTS WASTE OF GAS FROM RETORTS;
SAVES CLAY RETORTS FROM DESTRUCTION BY FIRE;
GREATLY ECONOMIZES THE USE OF FIRE-BRICKS;
And PREVENTS ALL POSSIBLE LOSS of GAS FROM LEAKAGE.
J. C. SELLARS,
THE GAS CEMENT WORKS,
BIRKENHEAD.



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E. KÖRTING'S PATENT
STEAM-JET GAS-EXHAUSTER.
Small Cost—Compactness—Perfectly Self-Acting—
Self-Regulating—Self-Cleansing—No Steam-Engine—No Attention—
No Extra Room Required—No Wear and Tear—No Noise—
No Oscillation in Vacuum, or Back Pressure.
UPWARDS OF 150 IN USE IN CONTINENTAL GAS-WORKS.
IN ENGLAND SUPPLIED TO—
Chartered Gas Co., London; London Gaslight Co., London; South Metropolitan Gas Co., London; Phœnix Gas Co., London; Liverpool Gas Co., Linacre; Corporation Gas-Works, Bolton; Cornholme District Gas-Works; Epsom and Ewell Gas Company; Horsham Gas Company; Gaslight Company, Ipswich.

E. KÖRTING'S PATENT STEAM-JET REVIVIFYING BLOWERS FOR THE PURIFYING MATERIAL.

W. CLELAND'S PATENT STEAM GAS-SCRUBBER,
Combining small cost and thorough efficiency, with absence of any mechanical means and necessity of renewing the scrubbing material.

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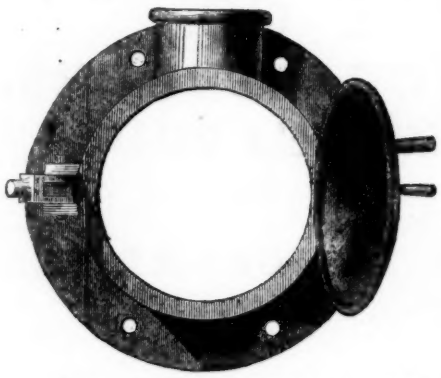
WITH

HOLMAN'S NEW PATENT BRACKETED CROSS-BARS,

ANTI-FRICTION CATCHES, AND ECCENTRIC FASTENINGS.



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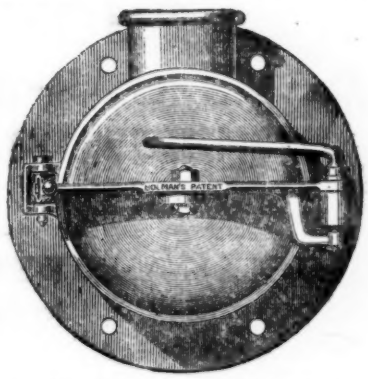
NO DUPLICATE LIDS REQUIRED.

INSTANTANEOUS SEALING EFFECTED.

HOLMAN'S NEW SELF-SUSTAINING CROSS-BAR ENSURES FREEDOM OF JOINT AND MAINTAINS PARALLEL POSITION OF THE LIDS.



Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested (rigid cast iron is now successfully employed), nearly 15,000 being in use at various Gas-Works in London and the Provinces, among which may be mentioned:—

The Gaslight Co., Beckton (where, by the end of 1875, nearly 4000 will be in use).
" Gaslight Co., Bow Common.
" Gaslight Co., Silvertown.
" Gaslight Co., Lupus Street.
" London Gaslight Co.
" Independent do.
" Phœnix do.
" South Metropolitan Gaslight Co.
" Commercial do.
" Imperial do.
" West Ham Gas Co.
" Gas-Works, Barnet.

The Gas-Works, Royal Arsenal, Woolwich.
" do. Lower Sydenham.
" do. Brentford.
" Consumers Gas Co., Woolwich.
" Alliance and Dublin Gas-Works.
" Edinburgh do.
" Manchester Corporation do.
" Salford do. do.
" Rochdale do. do.
" Liverpool Gas-Works.
" Birmingham do.
" Birkenhead do.
" Nottingham do.

The Newcastle-on-Tyne Gas-Works.
" Lurgan do.
" Carmarthen Gas-Works.
" Merthyr Tydfil do.
" Windsor do.
" Leeds do.
" St. Albans do.
" Over Darwen do.
" Rotherham do.
" Aylesbury do.
" Bournemouth do.
" Ystrad do.
" Cardiff do.
" Rochester do.

The Keighley Gas-Works.
" Aberdare do.
" Ballymena do.
" Richmond do.
" Stalybridge do.
" Longton do.
" Exeter do.
" Ross do.
" Falmouth do.
" Barrow-in-Furness do.
" Belfast do.
" Wakefield do.
And other Provincial and Foreign Gas-Works.

IMPORTANT TESTIMONIAL.

The Gaslight and Coke Company (Commonly called the Chartered Gas Company), Beckton, North Woolwich, July 2, 1874.

MESSRS. TANGYE BROTHERS AND HOLMAN.

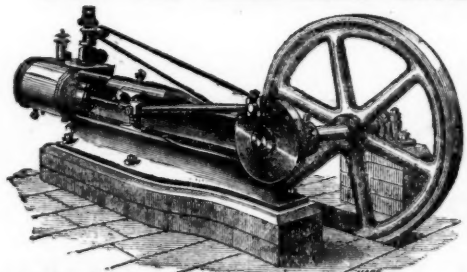
Gentlemen,—In answer to your inquiry respecting the Self-Sealing Lids, I beg to say that they continue to work well, and I have every reason to be satisfied with them.

I should be very sorry to return to the old system of Luting, and our stokers here freely acknowledge the benefit to them of the new system.

I am, yours truly,
(Signed) G. C. TREWEY.

TANGYE'S HORIZONTAL HIGH-PRESSURE EXPANSIVE

STEAM-ENGINES.



OVER 1500 SOLD SINCE THEIR INTRODUCTION IN DECEMBER, 1869.

In designing this Engine the utmost regard has been paid to simplicity of arrangement, strength of construction, and economy in cost. The working parts are considerably reduced in number, as compared with Horizontal Engines generally, rendering it far more durable and compact, the bed-plate, front cylinder cover, guides, and plummer-block for crank-shaft bearing being all cast in one piece, which in design and proportions is admitted by competent engineers to be perfect, and to afford a strength and rigidity that cannot possibly be attained in the best fitted engines of the ordinary horizontal type. The extraordinary stiffness of this Engine will permit of its being driven at a much greater maximum speed than engines generally, and with far less wear and tear. The cylinder with its valve-chest is bolted to the end of the bed. The cross-head slippers and connecting-rod ends are made adjustable, so that any wear can be readily taken up. The fly-wheel, cylinder-end, connecting-rod, and crank-plate, are all bright. All the parts are made to Whitworth's Gauges, and the material and workmanship are of the highest class throughout.

The Governor is of a very special description, and combines in the small space usually occupied by the ordinary steam stop-valve, a governor, throttle-valve, and stop-valve complete. It is exceedingly sensitive, simple, and compact.

These Engines are adopted in Gas-Works at Greenwich (Phœnix Gas Co.), Haggerston (Independent Gas Co.), Nine Elms (London Gas Co.), Falmouth, Harrow, Jersey, Plymouth, Richmond, Rochdale, Santiago (Chili), &c.

NUMBER NOMINAL HORSE POWER	B 2	C 3	D 4	E 6	G 8	H 10	J 14	K 18	M 25
Price of Engine, with Governor	£32	£38 15 0	£46	£70 0 0	£90	£115 0 0	£145	£185	£200
Feed-Pump, extra	3	3 15 0	4	5 10 0	6	7 10 0	8	10	15
Engine and Vertical Boiler on Base-Plate	75	95 0 0	110	150 0 0	180	225 0 0	280	—	—
Engine and Cornish Boiler, with Fittings	—	—	—	—	—	—	—	—	—
Variable Expansion Gear, extra	—	—	10	12 0 0	13	14 0 0	15	2	25

London 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.

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PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

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3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

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STREET-LAMP METERS,

AND REGULATORS FOR AVERAGE METER INDICATION.

METERS FOR MEASURING WATER.

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 28, 1875.

Circular to Gas Companies.

It is satisfactory to see, by the publication of the half-yearly reports of the metropolitan and other companies, that gas industry has now, to a great extent, returned to what we may call its normal state of prosperity, and that promise is given of a continuance of this condition of affairs for some time to come. Most of the reports mention the all-important fact that advantageous coal contracts have been made for the next year, so that profits may be considered to be assured, at all events, for that period of time. The future, however, cannot be calculated upon. It is a fact beyond question that the present low price of coal (which is, however, still much above the price of 1871) is owing to the depression in the iron trade, and troubles with the workmen engaged in the manufacture of iron. For these reasons, stocks of the metal are kept low, and production is restricted. This state of things, however, cannot be expected to endure. A revival in the iron trade is as certain as it is to be desired; and with it will come the colliers opportunity, and a repetition of the social and commercial phenomena that characterized the eventful years 1872–3, with consequences which gas companies have learned by bitter experience. We are not alarmists, but it is always well to look facts in the face; and these most certainly point to the conclusion that the present low price of coal cannot be expected to last. Let us, however, be thankful for present mercies, but, at the same time, not neglect the lessons of the past.

The report and accounts of the Chartered Company for the past half-year reveal a state of affairs which, we must say, we anticipated. With gas at 3s. 9d. per 1000, involving, as the report states, a reduction in the rental of the half year amounting to upwards of £100,000, the profits are not equal to the payment of full dividends, and the sum required to make them up absorbs nearly the whole of the unappropriated balance of last year.

As regards the immediate future, the report of the Chartered Company speaks in very hopeful terms. The contracts for the purchase of coal and for the sale of tar for the next twelve months are so advantageous, that the directors express themselves confident of being able to earn full dividends for the period, at the present reduced price of gas. So far all is highly satisfactory; but, for the reasons stated above, this prosperity can only be regarded as temporary, and the directors refer with concern to the threatened re-introduction of the "Regulations Bill" in the next session of Parliament. We have said so much of the obnoxious character of this Bill, which, in the case of the Chartered Company, seeks to repeal the protective clauses in the City of London Gas Act, 1868—clauses which were actually introduced by the authorities who are now endeavouring to get them repealed—that we shall not here further refer to it. We may, however, join in the appeal which the directors make to their shareholders, and, we may add, to all gas companies who value statutory rights, to exert their utmost influence to secure the defeat of a measure which strikes a blow at every joint-stock enterprise in the kingdom.

The Commercial Gas Company are necessarily prosperous. The balance carried to net revenue account is not quite equal to the payment of a full dividend, but the deficiency is only about £400. The directors of this company are usually reticent, but, on this occasion, they so far depart from their policy of silence as to express satisfaction at the passing of the Act they obtained last session—an Act, we may say, in most respects entirely different from the Bill to the promotion of which the shareholders gave their assent at the Wharncliffe meeting. The amalgamation with the Ratcliff Company must be regarded with satisfaction by all; but we have grave doubts whether, if the shareholders had been consulted, and had been fully informed of the nature of the measure promoted by the Corporation and Metropolitan Board of Works, they would have agreed to accept its provisions. The Bill the shareholders assented to, proposed to follow the lines of the legislation of 1868-69. The Act, at the passing of which the directors express their satisfaction, is the utter negation of the Act of 1860, under which the Commercial Company at present work, and the Acts of 1868-69, which the shareholders agreed to follow. For the present, of course, a full dividend is safe; but, having regard to the uncertainties of the future, and the outlay about to be incurred by the company, which must be unproductive for some time, it may well be doubted whether the prosperity will be continued. Events are, however, in progress which may possibly change the aspect of affairs.

The report of the directors of the Crystal Palace District Gas Company is a very satisfactory document. The profits of the half year do not quite pay full dividends, after setting aside £500 to the contingent, and £206 to the insurance fund; but the draw on the unappropriated balance is but small. A reduction of price to the extent of 1d. per 1000 feet from the end of the present quarter is announced, which will make the general price to private consumers 4s. 1d. per 1000. We hope, and may assume, that when the accounts of the current quarter are made up, the directors will see their way to a further reduction.

The circumstances of the Harrow Gas Company are gradually, but surely, improving. For the past half year they pay a dividend equal to 5 per cent. per annum, the best they have yet paid. Under present management, and without disturbing influences, the progressive prosperity of this company is assured.

It gives us great pleasure to record the fact that in the general prosperity mentioned above, the Dublin and Alliance Company fully participate. Something might be said about special causes, which have conduced to this result; but it is enough now to state the fact that the directors are able to recommend a dividend of 7 per cent., free of income-tax, out of the profits of the half year, to set aside £1000 in part payment of the loss sustained during the coal panic, and to place a balance of £511 to the credit of the contingent account. The directors have also determined to anticipate the statutory obligations of the company, and reduce the price of gas to 5s. per 1000 feet from the 1st of January next. We must express our perfect agreement with the policy adopted by the directors. They have every temptation to adhere to their present price, so long as their

Act allows them, in order to make up the losses they have suffered; but in making the consumers participators in their prosperity, the directors are most certainly "consulting the best "interests of the shareholders." The published accounts are so far deficient, that they do not show the gas made and sold per ton of coal; but we happen to know that the gas made is equal to the average make in our metropolitan works, and the unaccounted-for gas is but little in excess. By continued exertions on the part of the management, the "leakage" will, no doubt, be further reduced; as it is, all concerned in the company may be heartily congratulated on the present state of the affairs.

Along with a general expression of satisfaction at the lower price of coal, comes a general lament over the diminished value of coke. We have before remarked on the lower receipts for residuals, as shown in the accounts of the metropolitan companies for the past year, which was exclusively due to the low price obtainable for coke. There appears to be an impression in some quarters that a gas manager can get any price he pleases for his coke, the parties forgetting the maxim, that any article is only worth what it will fetch. Many attempts were made, while coal was at its highest cost, to force up the price of coke; but not one of them, we believe, succeeded, and in some instances we know that a heavy loss resulted. In good times, coke, we have calculated, produced about two-fifths of the amount expended on coal; but, on going through the accounts of the companies referred to above, we find that in the cases of those best situated for the disposal of this residual—the Commercial and Crystal Palace District—the sum obtained for it amounted only to one-third of the cost of coal, while the Chartered Company got only one-fourth, and the Dublin and Alliance but one-fifth of the value of the coal carbonized. It seems parodoxical that we should have cheap coke with dear coal, but there is no withstanding the logic of facts. We might digress here, and refer to the quotation made by Mr. Graham from John Stuart Mill, to be found in another column, which shows that with cheap coke there must necessarily be dear gas; but our space is nearly filled. The great economist never managed a gas undertaking, or he would have found that "the law that the demand for a commodity varies with its "value, and that the value adjusts itself so that the demand shall "be equal to the supply," cannot possibly apply to the commodity of coke produced in gas-works. Nevertheless it is a truth with some limitations, that with cheap coke the consumer must have dear gas.

The directors of the Chartered Company congratulate the shareholders on the high price secured for tar during the next year. There is a rumour abroad that the present value of tar is the consequence of an attempt to secure a monopoly of the manufacture of tar products in the metropolis. If such a monopoly could be established, gas companies would presently be at the mercy of the monopolists.

We have before hinted that ammoniacal liquor might, some day, become much increased in value. Beyond the every-day increasing demand for sulphate of ammonia for agricultural purposes, we notice two chemical processes, in an incipient stage, which, if perfected, and made practical, will give rise to a very large demand for ammonia, that can only be supplied from gas-works. On the whole, then, apart from the future price of coal, the prospects of our industry are not disheartening.

We have given some prominence to gas affairs in Swansea lately, because, if the designs of the Town Council had been carried out, a most important precedent would have been established. We know, as well as Mr. Alderman John Jones Jenkins does, that the Corporation of Swansea would never have obtained the money to set up competing works; but we are, nevertheless, pleased to see the turn affairs have taken. The proposed interview between the council and the directors of the company will, no doubt, result in a further reduction in the price of gas, which will for a time, at all events, satisfy all parties. The gas question in Swansea is, however, a purely personal squabble, and no one can tell how long one of the parties to it will be satisfied.

We published last week the half-yearly report of the Birmingham and Staffordshire Gas Company, in which it was stated that negotiations were pending for the transfer of the undertaking to the Corporation of Birmingham on the 1st of January next. We have since learnt that arrangements have been made for the transfer as from the 1st of July last, the date on which the old company was transferred. This will simplify the accounts of the Corporation, since they start with the two undertakings on the same day. An agreement has been entered into by the Corporation of Birmingham and the Handsworth Local Board, for the sale by the former and purchase by the latter, after six months notice, of so much of the undertaking of the Birmingham and Staffordshire Company as lies within their district. The agreement, we may take it, is a purely formal matter, and is not likely to be acted on for the present at all events.

The Town Council of Exeter and the gas company do not go on amicably together. We have already reported several complaints against the company for alleged nuisances, and to-day we have to record proceedings taken against them for sulphuretted hydrogen in their gas. The presence of this obnoxious body was not denied, but the case fell through on technical grounds. It would seem that the failure has somewhat exasperated the Corporation, who have resolved to take steps for the acquisition of the gas undertaking, by agreement, if possible; if not, by a compulsory purchase. Parliament, we may say, has never yet sanctioned the compulsory purchase of a gas undertaking; but a dangerous precedent was established last session in the case of the Birmingham Water Company, and it is, in the highest degree, desirable that a gas company should be able to go before a parliamentary committee free from the reproach of having conducted their business so as to be a nuisance to the community. We know nothing of the state of things in Exeter, except as they have been reported in our columns, and can only hope that many of the allegations made against the company have no foundation in fact.

Water and Sanitary Notes.

We reported last week the results of the first test applied to the pipes laid to convey the water from the Lintrathen reservoir of the Dundee Commissioners to Pitnappie, only one section of the newly made works. Another test was made according to arrangement, on the 17th inst., with still more disastrous results, as will be seen in another column. It seems clear that the pipes laid are not able to bear the pressure they were intended to withstand, and that they must be replaced by stronger, or worked at less pressure. It must be an anxious time for the Dundee Commissioners, who were so proud of their new works that they invited Royalty to open them.

From Liverpool we have a report that the Bleasdale scheme has fallen into disfavour, in consequence of the difficulty of finding a satisfactory foundation for the embankment of the proposed impounding reservoir. Thereupon the Windermere scheme comes to the fore; and it is said that recent surveys have shown that only one, and not three, pumping stations will be required in the course of the 64 miles which lie between the lake and Liverpool. The estimated cost of this scheme is thus considerably reduced; and we are informed that Mr. Jackson has been instructed to revise the report he recently presented to the Water Committee, and furnish new estimates on the basis of but one pumping station on the line.

A report, by Dr. J. Campbell Brown, on the water of the Bootle well, reveals the curious fact that the hardness of the water is slowly increasing. It is said, indeed, that it has increased nine degrees within seven years. The cause assigned by Dr. Brown is, that the yield of water in the strata is decreasing, owing to the continued pumping; and that the decrease of the water *not* passing through the calcareous beds is greater than the decrease of the water which does. The doctor is, no doubt, right, but the advocates of a well supply for Liverpool insist that, if larger bore-holes were made in the sandstone, plenty of soft water might be obtained. A very difficult task lies before the Corporation. Everything points to the necessity for adopting one of the large schemes submitted to the council; but it is to be feared that, when the selection has been made, the small ratepayers in the borough will defeat the council in their endeavours to carry it into execution. If Manchester were to join in the Windermere scheme, as proposed by Mr. Bateman, no doubt some grounds of opposition would be removed; but, at the best the cost to Liverpool will be something like two millions of pounds, an amount which must frighten the ratepayers.

A joint scheme for the disposal of the sewage of the Pottery towns has been several times suggested. It was proposed in May, 1874, but the local authorities did not act on the suggestion. In May, again, this year, deputations from the various towns met at Hanley and discussed the matter, and it was resolved that "the surveyors of Hanley, Stoke, Burslem, Tunstall, and "Fenton should confer on the subject of disposing of the sewage "of these towns, and report to a joint meeting of the local "authorities." We have never met with the report made by the surveyors, but we know that nothing has yet been done. Recently General Scott has given the Tunstall Local Board the benefit of his advice, and from his report we gather that the surveyors recommended irrigation. This was uppermost in the minds of the local authorities last May, when a deputation was appointed to wait on the Duke of Sutherland and ask him "if he would be willing to receive the sewage of the Pot-"tery towns, and deal with it on his property." We may assume that his grace declined the present; but the surveyors found 1200 acres of land at Tittensor fitted for irrigation, which they accordingly advised. This scheme General Scott condemns,

saying that it would prove costly and unremunerative, and he is no doubt right. What he recommends for Tunstall and Burslem appears to be a double system of drainage, whereby the storm water would be kept apart from the sewage proper, and the treatment of the latter with lime. There being but few closets in the district, the sewage is very weak, and the General suggests that the lime deposit may be dried, burnt, and used over and over again as a precipitant, to save expense. He does not propose to make cement in the Potteries.

Some members of the Tunstall Board seem to regard a joint scheme as "impracticable"—whether owing to jealousies on the part of the several boards, or physical difficulties, we are unable to say. It seems to us, however, that this is just a case in which the Local Government Board may interfere authoritatively, and insist on some joint scheme being promptly carried out.

We mentioned, a few weeks ago, that at the Romford sewage farm splendid crops had been grown, and then ploughed in, for what reason we knew not. The following explanation has been offered. "The crops ploughed in was an effort to convert "as much of the manure as possible into vegetation "by, first of all, growing with the autumn and winter "sewage a crop of rape, the better to store up in the soil "the sewage passing through it, and then the decomposing rape "forms a manure for the subsequent crop"! We shall begin to understand sewage farming presently. First we were told that sewage was an all-sufficient manure; next we were informed that it is advisable to dress the land with a considerable quantity of foldyard manure; and now we read that it is necessary to plough in one crop to serve as manure for the next. We have the further information that the bulk of the phosphates and potash in sewage exists in the solid mater in suspension—that is, in solid fœcal matter. Hitherto we have been taught that six-sevenths of the manurial value of sewage was to be found in the liquid portion; but we must live and learn.

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.*

(*Continued from vol.* XXV., *p.* 794.)

LXVI.

Iron Gasholder-Tanks.

We have already shown, in our historical sketch, that the earliest gasholders and tanks were rectangular in shape, the material employed in the latter being of cast iron. This method of construction was for years universally adopted, but gradually the shape was changed to the cylindrical form. Accum, writing in 1819, says, "At Birmingham they are now erecting a gasholder of the enormous magnitude of 40,000 cubic feet," and it may be observed that many similar, which upwards of 50 years ago were considered of great magnitude, and formed a portion of the works supplying our large cities, are to be met with at the present day doing good service in some of our small towns. With these facts in view, the question so often discussed as to the durability or life of a gasholder, must remain to be considered as still undecided.

During the early period of gas lighting, when its ultimate success was exceedingly doubtful, and its immediate results by no means remunerative to the shareholders, and when, although only in its infancy, it was supposed almost to have attained its utmost importance, the directors of gas companies evinced great caution in avoiding any extraordinary expenditure. Thus the augmentation of their gas stores or holders, like the rest of the apparatus, was gradual in the extreme. Commencing, in the first place, perhaps, with a holder of 10,000 feet, this, in the course of time, was substituted by another of double the capacity, and this, in its turn, was replaced by a third of still larger dimensions, as the requirements of their business demanded. As the site occupied by gas-works was generally very restricted, these various changes were usually made in the same locality, and it may be asserted, that frequently in old works no less than five or six different gasholders have, at successive periods, been erected on the same site, in order to keep pace with the growing demands for gas lighting.

For these numerous changes, cast-iron tanks were admirably adapted, as when, after having been in operation a number of years, they were found of insufficient capacity, they, with their holders, were disposed of to companies of minor importance, so that a portion of their first cost was realized. But, although this was undoubtedly an advantage appertaining to cast-iron tanks, it must be remembered that these vessels cost on the average double the amount of those constructed in brick or masonry, and that in the course of a few years, the interest accruing on the additional capital necessary for their construction would be much greater than the amount realized by the sale of the old apparatus. The advantage, therefore, was more imaginary than real.

Having arrived at that period when gasholders attained the magnitude of 60 feet in diameter, it seems to have been generally considered by engineers that no further augmented capacity was desirable, as they remained of that diameter for some years in the majority of large works. Many of our readers will recollect the plan of a work designed and published by a gentleman of eminence, on which there were no less than ten telescopic gasholders, each with a cast-iron tank, the united contents of the whole not reaching one million cubic feet. At the present time there still exists at one of the holder stations of a metropolitan gas-work a similar collection of holders of small capacity, one or more of which have probably existed almost from the first formation of the company, who, like their predecessors, had chosen a site for works entirely isolated from water communication.*

But, as gas lighting advanced, and its commercial importance became more fully realized, it was found to be indispensable, for every reason, to seek economy in the construction of works, and thus limit, to a certain extent, the capital invested. Amongst the economies introduced, was the construction of tanks of much more extensive capacities, and of less costly material than hitherto generally employed, some of which we have already described. Thus, at the present time, we find that the average capacity of the holders of the Imperial Company is about two million feet each, and their engineer appears to have accepted this as a standard; whilst at the Beckton works; although the first constructions were of a capacity of one million; they have more recently, at the same establishment, been constructed of a capacity of 1,500,000 feet. There are also many works, both in the metropolis and in the provinces, that have gasholders approaching in magnitude those just mentioned.

As the strength of the material entering into the formation of a tank requires to be increased in direct proportion with the magnitude of the vessel, it is obvious that the cost of cast-iron tanks, suitable for such holders as we have mentioned, would be almost fabulous. On the score of economy, therefore, if for nothing else, they are not usually employed. Moreover, as the requirements of a gas-work are now well understood, the apparatus in question are constructed of such dimensions as to avoid the expense formerly incurred in continually changing them; whilst their strength entitles them to be considered suitable for their purpose for several generations—indeed, practically everlasting.

Cast-iron tanks are, however, desirable under peculiar conditions; and in certain localities, where the ground is marshy, the want of solidity of the substratum renders them indispensable. In other places there may be an absence of suitable material or the skilled labour necessary for the formation of tanks of brick, masonry, &c.; or the site of the intended tank may be subject to periodical or permanent inundations, either by its proximity to a river or the sea, or by its low situation. These, and other contingencies, render it imperative, at times, to construct the holder-tank of cast iron. As before mentioned, these vessels, in works for the supply of small towns, have been sometimes formed of wrought iron, but their excessive expense has prevented them being more generally adopted. However, Mr. George Bower, of St. Neots, has deviated from the general rule, by constructing wrought-iron tanks of large capacities at prices which we are informed bear favourable comparison with those of brick and stone, and, as these must possess considerable interest, a description will be given of them hereafter.

The advantages of cast-iron tanks consist in the facility and promptitude with which they are erected, as they require little skilled labour. They are generally placed with their base at, or nearly on a level with, the surface of the ground; and, as the material entering into their formation is considerably lighter than that employed in other descriptions of tanks, no excavation nor extraordinary care is requisite in their foundations. Indeed, in some positions, as gravelly soil, this may be levelled, and the plates forming the base or bottom set thereon; and, in some instances, baulks of timber, placed on the ground and properly levelled, form the support, or foundation, for the tank and its contents. In marshy ground, as already stated, it will be necessary to drive piles. In such cases, too much care cannot be employed in having a sufficiency of them, and to drive to the desirable depth to ensure the proper support, as the whole of the weight of the tank, holder, and water reposes on them.

Cast-iron tanks are constructed of flanged plates, bolted together, the joints being afterwards cemented, in order to prevent the escape of water. The base or bottom is almost universally flat, similar to brick tanks as formerly constructed; but an exception to this rule is to be met with in Dr. Schilling's admirably illustrated "Traité sur le Gaz." In this is described the interior of a tank in the form of a dome, constructed of plates bolted and cemented. Such a construction may be admired for the skill displayed therein, but the utility, as we will show, must be somewhat doubtful.

The centre-piece at the base of the cast-iron tank is circular, as ordinarily constructed, and is sometimes composed of two or more plates. Around this are concentric rings of plates, each of about 12 feet area; their flanges, projecting upwards, being provided with bolt-holes and strengthening brackets, situated respectively about 6 inches apart. The side or wall of the tank is composed of a number of tiers of plates, averaging about 3 feet 6 inches or 4 feet in height, and 4 feet 6 inches in length, also provided with flanges, bolt-holes, and brackets, as described. The flanges are placed on the outside, which facilitates the erection, as also the means of stopping a leakage should it occur. But to render such a tank of sufficient strength to sustain the pressure of the water, a wrought-iron hoop or be. is necessary for each tier of plates. These hoops are supported by projecting lugs cast on the flanges, and are tightened by

* The publication of the "Treatise" has been discontinued for the last few months, owing to the heavy demands upon our space. We hope now to continue the publication through the coming winter.

* It is a singular fact that the Chartered, the City of London, and the Phœnix Companies all established their first works at a considerable distance from any water communication; and in 1815 the City Company was compelled, very reluctantly, by legal proceedings, to remove to the site they subsequently occupied.

cotters and jaws, each plate of the side of the holder being further secured by a wooden block, which is firmly wedged between it and the hoop. On these hoops depend materially the solidity of the sides of the tank. To show the importance of them, we may mention that on one occasion we met with a small tank of this kind, built without hoops, the engineer supposing the vessel would be sufficiently strong to dispense with them. Hardly, however, had three feet of water been pumped in, when it began to leak on all sides, but, on the necessary hoops being placed and properly wedged, the tank became as sound as could be desired.

The columns or guide standards of the holder are generally built on piers of brickwork, which are detached from the tank, and have suitable foundations in the ground. In small tanks of 24 feet diameter or less, brackets are cast or attached to the top of the tank, and on these are placed the guide-columns.

Similar to the construction of brick and other tanks, the thickness of the material in an iron tank is augmented in proportion to the depth and diameter of the vessel. Thus, in a tank 36 feet 6 inches diameter, and 12 feet high, the bottom central plates will be $\frac{5}{8}$ inch in thickness, and the outer ring 11-16ths of an inch, the two lower tiers will be of the same strength, but the two upper tiers will be reduced to $\frac{1}{2}$ inch thick. The bands, or hoops, will be required $3\frac{1}{2}$ inches wide and $\frac{3}{8}$ inch thick, with their corresponding jaws and cotters.

A tank of 71 feet 6 inches in diameter and 22 feet deep will require the bottom plates $1\frac{1}{8}$ inch thick, the two lowest tiers of the same thickness, the third tier 1 inch, the fourth $\frac{7}{8}$ inch, and the fifth $\frac{3}{4}$ inch thick. The hoops, one to each tier, will be 5 inches wide, and $\frac{5}{8}$ inch thick.

On account of their high price, cast-iron tanks are very seldom employed; but as there are localities where they are indispensable, we will proceed to give a specification for one.

Specification of a Cast-Iron Tank for a Gasholder 40 feet in diameter and 12 feet deep.

The tank to be 41 feet in diameter, and 12 feet deep to top of internal flanges on the bottom plates (internal measures), and to be constructed as follows:—

The bottom to be formed of four rings of plates, with a centre plate 3 feet diameter by $\frac{1}{4}$-inch thick. The first row next to the centre plate to be 4 feet $4\frac{1}{2}$ inches long by 3 feet 1 inch wide at the outer end, by 10 inches at the inner end, and 11-16ths inch thick of metal. The second row to be 4 feet $10\frac{1}{2}$ inches long by 2 feet 11 inches wide at the outer end, by 1 foot 7 inches wide at the inner end, and 11-16ths inch thick of metal. The third row to be 4 feet $10\frac{1}{2}$ inches long by 3 feet wide at the outer end by 2 feet $\frac{1}{2}$-inch at the inner end, and 11-16ths inch thick of metal; and the fourth row to be 3 feet wide at the outer end by 2 feet 3 inches wide at the inner end, and $\frac{3}{4}$-inch thick, and to be 4 feet $10\frac{1}{2}$ inches long from the inner end to the inside of flange on the outer end; this outer flange to project 3 inches above the plate, and to be curbed so as to coincide with the radius of the tank. On the top of this flange is to be formed the flange for bolting to the bottom ring of side plates, thus:—

The whole of the bottom plates to have flanges cast on them $\frac{1}{2}$-inch thick and projecting 3 inches above their upper surface, and provided with $\frac{3}{4}$-inch square holes for bolts, placed 6 inches apart from centre to centre, also brackets $\frac{3}{8}$-inch thick between the bolt-holes. Each flange to be set back 3-16ths inch from the edge of the plate, so as to leave a space of $\frac{3}{8}$-inch for jointing.

The plates to be bolted together by bolts $\frac{3}{4}$-inch thick, square under the head, with strong hexagon heads and nuts, and provided with 11-16ths inch washers. The joints to be made with the ordinary iron cement, well caulked in from the inside.

The sides of the tank to be formed of three tiers of plates, each tier consisting of 43 plates 4 feet high by 3 feet wide, and truly curved on the inner face to a radius of 20 feet 6 inches. The bottom tier to be $\frac{3}{8}$-inch thick, the middle tier 11-16ths inch thick, and the top tier $\frac{5}{8}$-inch thick. Each plate to have a flange cast on each of its four sides $\frac{5}{8}$-inch thick, and projecting 3 inches beyond its outer surface, with $\frac{3}{4}$-inch square holes for bolts, at 6 inches apart from centre to centre, and intervening brackets $\frac{3}{8}$-inch thick between all the bolt-holes. The outer extremity of these flanges to have chipping-pieces cast on them 3-16ths inch thick and the thickness of the plate, so as to leave a space of $\frac{3}{8}$-inch for jointing.

The plates to be bolted together with bolts $\frac{5}{8}$-inch thick, square under the heads, with strong hexagon heads and nuts, and provided with 11-16ths inch washers; the joints to be made with iron cement, well caulked in from the outside. The bolt-holes must be cast in the flanges in such a manner as to coincide exactly with each other, without chipping or enlarging, when the plates are fitted into their respective places. On the outside of the bottom and middle tiers of the side-plates, and at a height of 2 feet above their lower edges, a rib, or flange, is to be cast 3 inches wide and $\frac{5}{8}$-inch thick, with brackets on each side $\frac{5}{8}$-inch thick and 6 inches apart. These ribs are intended to form a level and continuous bearing around the outside of tank for the wrought-iron hoops. The vertical flanges, at the points where these ribs intersect them, to have projections cast thereon $\frac{3}{4}$-inch wide, for the purpose of supporting the wrought-iron hoops.

The hoops, or belts, to be three in number, one 4 inches broad and $\frac{3}{4}$-inch thick, for the bottom tier of plates, and the others 3 inches broad and $\frac{5}{8}$-inch thick, for the remaining tier. Each belt to be provided with three joints or couplings, in no part of less strength than the body of the belt, and with cotters of the same thickness. Each section of these belts to be in two pieces, which are to be connected by a fish-plate 18 inches long, and of the width and thickness of the respective belts, and rivetted thereto by $\frac{3}{4}$-inch rivets, at 2 inches apart from each other.

In the centre of one of the plates forming the third row of bottom plates, a hole, 5 inches in diameter, for the inlet-pipe is to be cast, and in the centre of the adjoining plate a hole, 6 inches in diameter, for the outlet-pipe. Each plate, for a space of 3 inches around the hole, to be made $\frac{3}{8}$-inch thicker than the rest of the plate.

The whole of the plates to be fitted together and plainly marked for fixing in their respective places, and to be painted with one coat of metallic oxide paint previous to delivery. The whole of the material herein specified to constitute a tank, which, when erected, shall be truly cylindrical, and of the dimensions given.

The total weight of the tank thus specified was 57 tons 7 cwt., of which about 52 tons were cast iron, the rest—being the belts, bolts, and nuts, &c.—were of wrought iron. Therefore, supposing the former to be £8, and the latter £18 per ton, the price delivered would be £512. To this must be added carriage, say 30s. per ton; and estimating the expense of preparing the ground to receive the tank, and the erection of the same to cost £60, a tank of this kind, under ordinary circumstances, would cost about £660. To this again must be added the cost of foundation and piers, which would make a total of £710, or nearly £45 per 1000 cubic feet capacity of tank—about three times the average cost of one constructed in brickwork or masonry. The excessive cost of cast-iron tanks must, therefore, always be a great obstacle to their adoption, and it is only under very extraordinary conditions, such as those already enumerated, that they should be constructed.

(To be continued.)

Communicated Article.

THE PRINCIPLE OF THE VALUATION OF GAS COAL.

By D. A. Graham.

(*Continued from vol.* xxiv., *p.* 499.)

A Method by which the Quantity and Quality of the "Coke" a Coal or Cannel produces may be introduced as an Element of Valuation and Comparison with other Coals or Cannels.

In the sixteenth chapter of the third book of John Stuart Mill's "Political Economy," where that writer is treating of "Some Peculiar Cases of Value," he illustrates the division of the subject he there discusses by instancing gas coke as a case in point; and, as some of his remarks bear on the subject under discussion, we shall quote a portion of the first paragraph of that chapter, where it is applicable for our present purpose. He says:—

It sometimes happens that two different commodities have what may be termed a joint cost of production. They are both products of the same operation, or set of operations, and the outlay is incurred for the sake of both together, not part for one and part for the other. The same outlay would have to be incurred for either of the two if the other were not wanted or used at all. There are not a few instances of commodities thus associated in their production. For example, coke and coal gas are both produced from the same material, and by the same operation. In a more partial sense, mutton and wool are an example; beef, hides, and tallow; calves and dairy produce; chickens and eggs. Cost of production can have nothing to do with the value of the associated commodities relatively to each other. It only decides their joint value. The gas and the coke [and he might have added the tar and the liquor] together have to repay the expenses of production with the ordinary profit. To do this, a given quantity of gas, together with the coke which is the residuum of its manufacture, must exchange for other things in the ratio of their joint cost of production. But how much of the remuneration of the producer shall be derived from the coke, and how much from the gas, remains to be decided. Cost of production does not determine their prices, but the sum of their prices. A principle is wanting to apportion the expenses of production between the two.

Since cost of production here fails us, we must revert to a law of value anterior to cost of production, and more fundamental—the law of demand and supply. The law is that the demand for a commodity varies with its value, and that the value adjusts itself so that the demand shall be equal to the supply. This supplies the principle of reparation we are in quest of.

Suppose that a certain quantity of gas is produced and sold at a certain price, and that the residuum of the coke is offered at a price which, together with that of the gas, repays the expenses with the ordinary ratio of profit. Suppose, too, that, at the price put upon the gas and coke respectively, the whole of the gas finds an easy market, without either surplus or deficiency, but that purchasers cannot be found for all the coke corresponding to it. The coke will be offered at a lower price, in order to force a market. But this lower price, together with the price of the gas, will not be remunerating; the manufacture, as a whole, will not pay its expenses with the ordinary profit, and will not, on these terms, continue to be carried on.

The gas, therefore, must be sold at a higher price to make up for the deficiency on the coke. The demand consequently contracting, the production will be somewhat reduced, and prices will become stationary, when, by the joint effect of the rise of gas and the fall of coke, so much less of the first is sold, and so much more of the second, that there is now a market for all the coke which results from the existing extent of the gas manufacture.

Or suppose the reverse case—that more coke is wanted at the present prices than can be supplied by the operations required by the existing demand for gas, coke being now in deficiency will rise in price. The whole operation will yield more than the usual rate of profit, and additional capital will be attracted to the manufacture. The unsatisfied demand for coke will be supplied, but this cannot be done without increasing the supply of gas too; and as the existing demand was fully supplied already, an increased quantity can only find a market by lowering the price. The result will be that the two together will yield the return required by their joint cost of production; but that more of this return than before will be furnished by the coke, and less by the gas. Equilibrium will be attained when the demand for each article fits so well with the demand for the other, that the quantity required of each is exactly as much as is generated in producing the quantity required of the other. If there is any surplus or deficiency on either side, if there is a demand for coke, and not a demand for all the gas produced along with it, or *vice versâ*, the values and prices of the two things will so readjust themselves that both shall find a market.

When, therefore, two or more commodities have a joint cost of production their natural values relatively to each other are those which will create a demand for each in the ratio of the quantities in which they are sent forth by the productive process. This theorem is not of itself of any great importance; but the illustration it affords of the law of demand, and of the mode in which, when cost of production fails to be applicable, the other principle steps in to supply the vacancy, is worthy of particular attention.

We have quoted the preceding interesting passage *in extenso* for reasons which will be apparent. It, perhaps, embodies all which might be said of the subject Mill there discusses (the joint values of two or more products which are the necessary result of one operation). But there are a variety of other circumstances which affect the value of coke which it might be well to enumerate, before drawing any deduction applicable as a principle to its comparative valuation.

In the previous valuations, we took no account of the great diversities of quality and quantity which must necessarily affect its saleable value, and some of these in a somewhat remarkable manner. For, paradoxical as it may seem, the worst qualities of coke a district produces frequently fetch the largest prices. We know of two works, situated about twelve miles apart, in one of which an inferior cannel coke realizes more per ton sold than a much superior quality produced from common coal, fetches in the other,

and this occurs in a district where the conditions of consumption of gas (proportion required for consumption) are in many respects similar.

In the one case, the quality of gas manufactured is equal to 25 candles, where the cannel is principally used, and in the other the quality is equal to 18 candles. The relative consumption of gas in each of these cases will probably approximate to nearly the inverse ratio of these two numbers; so that, although the conditions of consumption are such that the demand in each case would be nearly proportional to the respective populations of these two towns, were each of these works to manufacture a similar quality of gas, nevertheless, as a less quantity of coke is produced at the works where the cannel is used, and although this less quantity is of very much inferior quality to that produced at the works where common coal is used, still it fetches a much higher price, on account of its greater scarcity, but not quite so much as would induce the other company to sell in their market.

Other reasons and causes also conduce to the same end. A cannel generally produces a much less per centage of coke than a common coal; and as its heating power for furnace purposes is considerably inferior to that produced from common coal, it follows that, in furnaces similarly constructed, a much larger per centage of cannel coke will be used for firing purposes.

The construction of settings themselves may also affect the price of coke, for an upright draught will consume a larger quantity of coke than a down draught; for which several reasons it will be apparent that it does not follow that the company which use the cannel coke will obtain the larger revenue from its sale, although the ton sold may fetch a much larger amount than at the works where common coal coke is manufactured.

An example will render this reasoning more apparent. Let the weight of coke a cannel will produce be equal to 55 per cent. of the weight carbonized, and the weight of coal coke be equal to 66 per cent. of the weight carbonized. And let the cannel furnaces utilize 45 per cent. of the weight carbonized, and the common coal furnaces 33 per cent. of the weight carbonized. Then the residue of coke which could be sold from the ton would be $(55 - 45) = 10$ per cent. of the cannel coke, and $(66 - 33) = 33$ per cent. of common coal coke. But we stated the respective illuminating power for each of these gas-works to be 25-candle gas for the locality where the cannel coal was used, and 18 candles for the district where the common coal was used; all other things being proportional and similar, including the makes per 1000 for the coal and cannel respectively. The relative residues of coke which could, in each case, be sold, would be as $(18 \times 10) = 180$ for the district where the cannel coke was manufactured, to $(33 \times 25) = 825$, which would represent the proportional weight which could be sold in the district where common coal was used.

But were we to estimate the production of the ton of cannel to yield 10,500 cubic feet to the ton, and the production the coal would yield at 9500 to the ton, the disparities of coke produced would be still greater;

$$\text{for } 180 \times 95 = 17{,}100 \text{ cannel coke,}$$
$$825 \times 105 = 86{,}625 \text{ coal coke,}$$

and the ratio of the quantities which could be sold at the one works, and the quantity which could be disposed of at the other, would therefore be

$$\text{as } 86{,}625 \text{ of coal coke}$$
$$\text{to } 17{,}100 \text{ of cannel coke,}$$

which is in the ratio of 5·06 of coal coke to one ton of cannel coke.

This reasoning may show why cannel cokes sometimes fetch a much larger price than the common coal cokes manufactured in their immediate vicinity.

But it also shows that this enhanced price will not generally compensate for the greater quantity which can be sold where common coal is used, inasmuch as the disparity of prices realized for each was never so great but that it was fully compensated for by this greater per centage of coal coke which remained for sale.

It might be well to introduce another phase of this question here—the quantities of cannel and coal which these two companies would respectively use, comparing this quantity with these other results:

	Candles.	Production.	
Coal	$= 25 \times 105 = 2625$		1·54
Cannel	$= 18 \times 95 = 1710$	$=$	1·00

so that the ratio of coal used would be as $1\frac{1}{2}$ to 1, which would represent the amount of cannel used. The ratios of cannel coke made we took at 55 per cent. to the 66 per cent. produced from the coal, while the amounts sold would be in the ratio of five tons of coal coke to one ton of cannel coke.

This will show that, in valuing cannel coke, some factor, or constant, or series, should be used, which would give expression to the amount of the loss here indicated, and this would doubtless vary with localities—perhaps requiring empirical rules for each variety of cases; but generally, we think, this loss should not be estimated at less than the numbers which would be found from multiplying the evaporative power of the whole coke a ton of coal or cannel was found to produce, by the price which expressed the average year's value of the coke sold in that district, which price corresponded to the tabular number representing the evaporative power of the average quality produced.

(To be continued.)

Rio de Janeiro Gas Company, Limited.—The directors of this company have decided to pay an interim dividend at the rate of 10 per cent., free of income-tax, on and after the 6th prox., for the half year ending the 30th of June last.

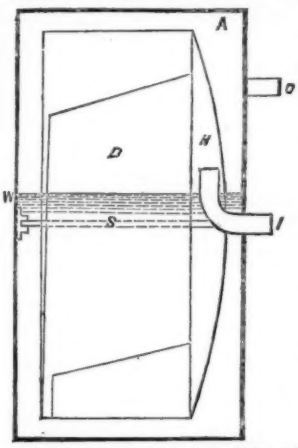
Correspondence.

STATION-METERS WITHOUT CASES.

Sir,—Your correspondent, "Micawber, Jun.," seems (if one may judge from the expressions contained in his letter in yesterday's number of the Journal of Gas Lighting) to think that the measuring-drums of station-meters are put into cases in deference to "old-established notions," and because it is difficult to "get old fogies to move out of the beaten track." Before proceeding to show him that such is not the fact, I must express my gratification that he shows himself to be by no means free from the influence of "old-established notions," at all events in respect to geniality of disposition being a commendable quality, and although he styles himself "Junior," yet, like many *seniors*, he is "old fogie" enough to believe in good whisky, and is, I feel pretty sure, one whom it would be difficult to "move out of the beaten track" on which it can be obtained.

I much regret my inability to accept and avail myself of a *free pass* "over our railway *as far as it goes*," as I am quite certain that a week or two of indulgence in "unadulterated" "mountain dew," and in unadulterated mountain *air*, accompanied by a little pleasurable association with Micawber, would do me "a power of good." Anyhow, I thank him for his invite to visit "Glenmutchkin," although the invite is a general one; and the next time I find myself with a noggin of whisky before me, I will certainly drink to the health of Micawber, and express my sincere wish that he may never find *himself* in such a "case" as to be unable to obtain a "wee drappie" when he wants it.

However, *revenons à nos moutons*. Were it not that a proposition identical with that of Micawber was gravely put before me some years since, I should hardly take his question *au sérieux;* but as my previous experience induces me to think he is in earnest, I will simply reproduce the arguments which I employed on the occasion referred to, and these will, I think, convince Micawber that with a station-meter a *case* is even more necessary than it is for a watch; just as absolutely needful, indeed, as is a *water-tank* for a gasholder of the common kind. To make the matter plain, I must be somewhat elementary. Let the following diagram be supposed to represent the vertical section of a meter:—



A is the case, charged with water to the line W; and D, the drum with the journals of its shaft, S, resting in bearings attached to the case, so as to be free to revolve. H is the "hood;" I the "spout" or inlet rising within the "hood" to above the water-line, while O is the outlet. When the meter is at rest, and no gas pressure is acting within it, the water-level is, of course, uniform; but the moment gas is admitted through the inlet at any pressure a change takes place; the water-level is depressed within the drum D, and elevated within that part of the case which is external to the drum, and the amount of displacement will depend upon the resistance to motion offered by the drum, which resistance will vary with every change in the rate of working.

Now, under the usual conditions of use, the pressure operating on the *inlet* of a station-meter will be (1) pressure of storeage gasholder, *plus* (2) pressure needful to overcome the friction between the gasholder and the meter, *plus* (3) pressure needed to overcome the friction or resistance of the meter itself; while the pressure on the outlet will equal the sum of these pressures, *minus* (4) the resistance of the meter. Thus, suppose the gasholder gives 6 inches and the connecting mains to outlet of meter absorb 0·2 inch, then the outlet pressure at the meter will be 6·2 inches; and, if the working friction of the meter be 0·4 inch, then the inlet pressure will be 6·6 inches, and if the receiving gasholder increase in its pressure to 7 inches, and the friction in the main be still ·2, then the pressure on the inlet of the meter will be 7·6 inches.

Here, then, we have a displacement of water only to the extent due to the resistance of the drum; but, supposing a second hood be put on to the outlet end of the drum, with a second spout to convey the gas away, and all that part of the case which contains gas be dispensed with, what would result? Why, simply that the meter would be put under conditions similar to those to which an ordinary pressure-gauge is subjected—the water within the measuring part of the drum would be depressed, not only to the extent due to working friction, but to the extent due to the acting pressure; and, as there would be no counteracting back pressure, except within the comparatively small area of the outlet hood, it follows that any variation in the pressure or resistance offered by the receiving gasholder, would be attended by a change in the levels of the water within the drum and tank, and that such change would be, as in an ordinary pressure-gauge, directly proportional to the variation in the relation of the pressures, and, as a consequence, serious errors in measurement would result. In fact, there could not in my opinion be anything like correct measurement at all.

Another objection is that, in order to prevent the gas from blowing through the centre of the drum, it would be necessary to meet the greater and uncertain depression of the water within it—to increase the "seal," thereby reducing the capacity of the drum, and, as I believe, increasing its working friction.

There are possibly some other points of objection which I might raise upon a somewhat longer consideration, but I will not now seek for them, but limit myself to one other, which is, that the drum would be liable to rapid destruction from its exposure to the oxidizing effects of the atmosphere combined with moisture, so that instead of lasting, as a well-made drum will, for best part of a long human lifetime, under the usual conditions, it would in all probability be rusted out in a very limited number of years—even, it might be, within two or three.

Some one may say, "Make it of stouter plates, then." Well, do so, and the result would be increased resistance to motion and greater cost. Another may say, "Tar varnish it outside every six months or so."

Well, that means throwing the meter out of action for some hours at least, if it be of any considerable size, and the cost of labour and varnish, with an accumulation of coat upon coat, until the drum would become as streaky as the streakiest of bacon, and *drag* more and more heavily through the water.

And, after all, what is to be saved? *The case?* Certainly not, for the most expensive part—viz., that which contains the water—*must* be retained, and the only saving would be just the upper part, which, if it were desired, might be a simple wrought-iron cover, which would cost probably as little *or less* than the *second hood*, with its necessary spout and extra fitting.

The cases of station-meters have heretofore been erected above ground, and have been constructed of cast iron, but, of course, there is nothing to prevent a case being made of brick or concrete, partly or wholly below the ground line, while the *top*, under the latter condition, might consist of cast-iron plates forming a floor; the index being contained in a pedestal to which the pressure-gauges might also be attached. I do not think there would be much saving of cost in this plan, while what, as regards a large meter, is one of the most imposing-looking instruments to be found on a gas-work, would be put into an inferior position, and thrust out of sight.

I intend to make some experimental trials with a meter or meters, and will give you the results, whether they confirm or negative my position in respect to registration, if possible in time to form an appendix to this in next Tuesday's number.

I just learn that a meter maker in Paris is actually constructing a double-hooded meter. Well, "Time will show."

F. W. Hartley.

55, Millbank Street, Westminster, S.W., Sept. 22, 1875.

Sir,—The proposition of your correspondent, Mr. Micawber, to dispense with the upper portion of the case of a station-meter, is not entirely new, and I believe the plan is now being carried out on a large scale by the most extensive firm of gas-meter manufacturers in France.

That a station (or other) meter can be constructed as suggested, by dispensing with the upper portion of the case, the wheel being provided with two hollow covers, the one at the front and the other at the back, with their corresponding syphons for the inlet and the outlet, there can be no doubt. The only evils to guard against are the possibility of unsealing the centre opening of the outlet, whenever the meter is driven much beyond the speed for which it is calculated, or the chances of any foreign substance falling into the case, which might impede the action of the drum, or if a stoppage occurred in the mains, and there being no other seal whatever than that of the meter-wheel. In both these contingencies the gas might escape at that point.

Beyond these, I see no difficulty whatever in the arrangement proposed. I therefore advise your correspondent to make a trial of the apparatus, by constructing a strong wooden tank of the required dimensions, and of a square form, which will last as long as he can desire, and on this to screw the supports for the shaft. This done, and the wheel with the two hollow covers fitted in their places, the inlet and outlet spouts will be fixed; and, as our friend appears an amateur in this department of gas engineering, it is necessary to apprise him that this is a point that requires great care, to prevent the spouts touching the hollow covers or hoods during the revolution of the wheel. Communication can then be made with the inlet and outlet pipes; and if your correspondent succeeds as I anticipate, he will be rewarded by the extra life or motion of the meter-wheel being continually exhibited at his works, and the writer may be tempted to taste of the "unadulterated" he so kindly offers.

Nemo.

STATION-METERS WITHOUT CASES AND METERS WITH CONSTANT WATER-LEVEL.

Sir,—We should have thought the days of "old vats" being employed in gas-works were quite over, had not Micawber's letter been published. In reading it, our thoughts naturally wandered back into the far past, when brewers vats were more common things in gas-works—to the time when it was proposed to make the meter a maid-of-all-work in gas establishments: to measure the gas, to keep a check upon the workmen, to drive the wet lime purifiers, &c.

Not only Accum, whom we might excuse, but Peckstone enters into a lot of calculations, and gives some eight or ten pages of matter and "rules" for ascertaining the power, &c., of the gas-meter if applied for the purpose of working machinery. Peckstone adds, "There is but one more remark to make on the subject of the meter when used as a moving power; it is, that a meter, such as has just been described, of sufficient strength to last seven years, might be constructed and fixed up at a cost not much exceeding £30; and this meter would perform the work which employs two labourers, whose wages could not be less than 18s. each per week, or together at the rate of £93 12s. per annum . . . . or of £644 14s. in seven years."

Now, if a meter, like a maid-of-all-work, were so much overtaxed, the work proper would suffer—the measurement would vary with every variation of its secondary duty, working at the purifiers, &c.—so it would be with Micawber's vatted meter. The difference between the internal and external water-lines of the drum would be the pressure of the gas over the atmosphere, and not, as when cased in, the pressure absorbed by the action of the meter. In the latter case this would be constant, subject to the water-line; but in the former it would be ever varying, and certainly "move out of the beaten track."

It is with some reluctance that we notice another matter that has found a place in the columns of your last two issues—"Meters with Constant Water-Level." It will be pardonable if *we* say we hoped this, too, was a matter of "vats"—a thing of the past. A constant *measure* is what is required, but not given by a constant water-line. The wear of shafts and bearings affects the measurement, and this cannot be met by any arrangement of constant water-level; an unvarying chamber, as in our "self-regulating drum," *alone* can give it. The idea, however, like many others in connexion with the measurement of gas, is very beautiful, and could only have been thought of by one as intimately acquainted with the physical conditions of gases as Mr. Reid. He most ingenuously sets forth in his provisional specification the power of the principle:—"As the gas passes over the water, it absorbs the moisture, or takes up *more or less* of the water, according to its temperature and its absorbing power." To which might also have been added the *time in contact* with the water—a very important element, it appears, in the saturation of gas with aqueous vapour. Fownes writes:—"When a liquid evaporates into a vacuum, the point of greatest density is attained at once, while in the other case some time elapses before this happens; the particles of air appear to oppose a sort of mechanical resistance to the rise of the vapour." But in the arrangement lately placed before the French Association, saturation appears to be scarcely possible; the cubical content of the "saturating reservoir" being such that the whole volume has to be passed through in about two seconds, with the normal quantity of gas passing through the meter.

Now, it appears scarcely possible that, under ordinary circumstances, gas will be thoroughly saturated in passing through a meter; and yet no comparison can be made, it may be said, between the relative area of wetted surfaces of meter proper and "saturating reservoir," or of the time in which the gas may be in contact with the same.

Taking the woodcut as representing a 5-light meter, with case of 13 inches diameter, and the width of "saturating reservoir" as 3 inches, divided into four channels, with a depth of one inch, the contents of the drum, taken at 345 cubic inches, will have to pass over an area of 28·5 square inches. One-fourth of 345—one quarter of the wheel—gives, say, 86 cubic inches in passing over the 28·5 square inches, has also to pass through the inlet and outlet hoods, which give 50 square inches of wetted surface, or nearly double the area of the so-called "saturating chamber;" but beyond this there are nearly 300 square inches of wetted surfaces in each quarter of the wheel, besides the water surface to which the gas in exposed. The cubical contents of the "saturating reservoir" are taken at the high water-line, but with this lowered a larger volume of gas will pass, without any increase in the water area. There are other points that might be noticed, such as the relative temperatures of water and gas in the two chambers, the condition of the gas, the position of the meter; but it is obvious that they must so prejudicially affect the operation of the principle, that it cannot be practically applied to the measurement of gas. No further proof of this is needed than the fact that the invention was published 13 years since, and has not yet been carried into practical operation.

Warner and Cowan.

Edinburgh, Sept. 25, 1875.

BUENOS AYRES MUTUAL GAS COMPANY.

Sir,— In No. 644 of the Journal of Gas Lighting, a statement has been published respecting the Mutual Gas Company of Buenos Ayres, taken from the *Standard* newspaper of that city. The statement says: "The municipality owes the company 101,206 patacones, which it is believed they will pay off gradually every month." Respecting this, I have to say, that when the company I represent declined to continue supplying the public lighting (because they could not get paid for it) the municipality owed £60,000, of which nothing has been paid to this day, not even the interest on the municipal bond the company hold. How far the debt to the Mutual Gas Company is likely to be paid off as stated, may be judged from the fact, that the municipality collect a tax for lighting, which is levied on every street door, so that in the centre of the town they derive a high profit. If, already, the debt to the Mutual Gas Company is 101,206 pat. on 2260 lamps, how will it be when the lighting is further extended to the suburbs, where, there being few doors, the tax does not cover the cost of lighting? The increase in the private consumption is stated to be from 1,154,000 feet in January, to 2,720,000 feet in June. This is nothing very particular, as January is midsummer, and June midwinter, at Buenos Ayres. The average of the figures given shows a total consumption in the six months of 11,622,000 feet, which at 5 pat. per 1000 feet makes 58,110 pat., and the 2260 public lamps give in the six months 59,664 pat.; total 117,774 pat., and out of this sum (with 32 public lamps and 27 private consumers to the mile of main-pipe) it is coolly asserted that 65,380 pat. profit have been made, also that this sum is the net profit which the Mutual Company hold. As a part of the private, and all the public lighting, was still due at the end of June, the Mutual Company must have held a net profit larger than the actual sum collected. This fact (!) proves that the said company must be something like a humming bird that lays ostrich eggs. Believers may rejoice, as the British public is to have a chance, the "young company" being generously willing to be converted into an English company, under the style of "Buenos Ayres Gas Company, Limited."

Louis Wilde,
Agent for the Buenos Ayres Gas Company.

4, *Cable Street, Liverpool, Sept.* 25, 1875.

GIROUD'S RHEOMETER.

Sir,—I have been repeatedly asked, by well-known gas engineers and others, whether Mr. Giroud's rheometer had been removed by the Paris Gaslight Company from their street-lamps (where they were put up about three years ago for a practical test), and were now condemned by the company as useless for the purpose. I immediately informed Mr. Giroud of these false rumours, and herewith beg to submit to you and your readers Mr. Giroud's own reply, with a fair translation.

Trusting to your love of truth and justice, I feel confident you will give this a space in your next number.

S. Leoni.

London, Sept. 22, 1875.

Paris, Sept. 20, 1875.

Dear Sir,—You informed me, they say in London that the Paris Gaslight Company has had removed my rheometers, and given up their use.

I beg to give the most formal contradiction to these rumours, which are quite untrue. No doubt their object, in spreading such news, is to prevent the adoption of the rheometer. I beg further to state that I never received any complaints from the Paris Company, or any other of the numerous French and other foreign gas companies who are now using 70,000 rheometers.

Yours faithfully,
(Signed) Giroud.

To Mr. S. Leoni, London.

Social Science Congress.—The next meeting of the National Association for Promoting Social Science will be held at Brighton on Oct. 6. The president will be Lord Aberdare. The Hon. Sir E. S. Creasy will be president of the Jurisprudence and Amendment of the Law Section; Sir Charles Reed will preside over the Educational Department; Dr. Richardson will be president of the Health Section; and Mr. Grant Duff president of the Economy and Trade Section. There will be an exhibition of sanitary and educational appliances, including also such inventions as may be of domestic interest. And the evenings will be devoted to the delivery of lectures on subjects related to the objects of the association.

Legal Intelligence.

CENTRAL CRIMINAL COURT.—Wednesday, Sept. 22.

(Fourth Court.—Before the Right Hon. the Recorder.)

CONVICTION FOR GAS STEALING.

Mr. *George Sanderson*, the proprietor of the Cadogan Hotel, Sloane Street, Chelsea, surrendered to his recognizances, and was indicted for stealing 600,000 cubic feet of gas, the property of the London Gaslight Company. He pleaded "Not guilty."

Mr. Besley and Mr. J. P. Grain were counsel for the prosecution; Serjeant Parry (with whom were Mr. Montagu Williams and Mr. Mead) appeared for the defence.

The circumstances of the case, as given in evidence at the repeated examinations before the magistrate at Westminster, have been fully reported in the Journal. It will be sufficient, therefore, now to state that the accused, besides owning the hotel, possesses considerable property in the neighbourhood at the rear, and in August, 1871, he was in possession of a cellar in one of those houses—131, Pavilion Road—in which gas had been supplied, and afterwards cut off by the company. Before November of that year there were no means of lighting the cellar but by candle, or of warming it, but about that month the gas was put on to a gas-stove in the cellar, the company's pipe being removed, and gas supplied to the stove by means of a socket and india-rubber tubing. This having come to the knowledge of the company, they surrounded the house on the 19th of July, and examined the cellars of the hotel. The defendant admitted that there was gas in the cellar, and said that it was supplied from his meter at the hotel by an underground communication which he could not point out; and when the cellar in the rear was explored and no meter found, he expressed the greatest surprise, and wished to see the directors of the company, but they declined to see him, and instituted the present proceedings.

Serjeant Parry, for the defence, admitted without any reserve that the defendant had been guilty of much imprudence and carelessness, and that he had fancied, without any ground whatever, as it proved, that he had a right to act as he had. The defendant happened to keep in his cellars a large stock of wine, which became injured by the cold; and, knowing that there was an old gas-pipe somewhere about, he fixed on some india-rubber tubing, not with a view to obtain light, but solely for the purpose of giving some heat to these underground vaults and their contents. He had no idea whatever that he was doing wrong. The learned serjeant made an able appeal for the defendant, who had hitherto borne an irreproachable character.

The jury, after an absence from court of nearly two hours, found the defendant "Guilty," explaining that they believed that his original inception of the plan was innocent enough, but that his subsequent continuance of it was felonious.

The Recorder said he should like to take time to consider the sentence.

Thursday, Sept. 23.

The prisoner was brought up this morning to receive judgment.

The Recorder, in passing sentence upon him, said he lamented to see a person of the prisoner's apparent respectability placed in so degrading a position. Prisoner would, doubtless, be horrified at being accused of picking a pocket, and yet he had condescended to the commission of such a mean and shabby theft as that which had been conclusively brought home to him. He would have to be imprisoned for three months, with hard labour.

In reference to the above case, it may be mentioned that on Thursday last an application was made to the magistrate (Mr. Arnold) at the Westminster Police Court for an authority to carry on the business of the hotel belonging to the prisoner until the next licensing day. Mr. Childs, solicitor, who made the application, having stated the fact of the prisoner's conviction, said the Licensing Act enacted that when a person holding a licence was convicted of felony, an application could be made to a magistrate for power to carry on the business until the next general licensing day. Mr. Arnold said the section under which Mr. Childs applied had reference to the owner, who could carry on the business, if the tenant holding the licence was convicted of felony, until the next licensing day. Mr. Childs said Mr. Sanderson was the owner of the premises. Mr. Arnold remarked that the Act made a distinction between the person licensed and the owner. If the former was convicted, the latter could apply to a magistrate for permission to carry on the business until the next licensing day. As he understood it, Mr. Sanderson had forfeited his licence by reason of his conviction. Mr. Childs said under the 14th section a person convicted of felony was for ever disqualified from holding a licence, but a licence could be granted to another person to carry on the business until the next licensing day. Mr. Arnold stated that the Act did not say that any one could do so. The owner could, and the owner must be a distinct person from the holder of the licence. Mr. Childs said there would be no alternative than to close the house. Mr. Arnold said if Mr. Childs would like to consider the matter, and renew his application, he should be glad to hear him, but the application must be made on behalf of some other person than the man convicted. Mr. Childs said he would consider the subject, and renew his application. On Saturday, Mr. Mead, a barrister, attended the court, and stated that the owner of the house was a Captain Corbyn, on whose behalf he renewed the application, which, after the necessary inquiries, was complied with.

COURT OF SESSION, GLASGOW.

Bill Chamber, Thursday, Sept. 23.

(Before Lord Ormidale.)

CORPORATION GAS COMMITTEE, *Appellants*, *v.* DODDS, ASSESSOR, *Respondent.*

The Dean of Faculty and Messrs. McLaren and Balfour appeared for the appellants, Mr. Moncreiff for the assessor, Mr. Trayner and Mr. McIntosh for the City Parochial Board, Mr. Burnet for the Barony Parochial Board, and Mr. Brown for the Govan Combination Parochial Board.

It appeared from the arguments that Mr. Dodds—taking the gross revenue at £345,000—deducted from that amount the working charges in the shape of the cost of manufacturing the gas and of distributing the gas, and of the repairs on the works, pipes, &c., as also the expenses of management; and in this way arrived at the net earnings—£114,000. He thereafter proceeded to make the following allowances on or deductions from the net earnings. First, he allowed 5 per cent. interest on a sum of £115,373, or half of the working capital, as the amount of the floating capital required to carry on the works; and that although the accounts for the gas sold were paid quarterly. Next, a sum of £8063 was deducted in respect of the depreciation of the meters, together with an allowance of 5 per cent. on the cost of the meters as interest, and of 2½ per cent. for risk of explosion. A total allowance of 12½ per cent. from the net revenue was thus made. The Gas Commissioners objected to this allowance as insufficient, and claimed that it should be increased to 25 per cent., in the shape of 5 per cent. as interest on capital, 5 per cent. for depreciation, 3 per cent. for risks, and 12 per cent. for tenants profits.

Mr. Moncreiff, for the assessor, maintained that any allowance for tenants profits was excluded by the terms of the Corporation Act, which prescribed that they should supply gas to the inhabitants of Glasgow as nearly as possible at its prime cost, and without profit. A tenant, accordingly, could not offer a rent in the view of obtaining profits as in ordinary mercantile speculations, as no allowance could be made him out of the gross earnings beyond the cost of the manufacture and distribution of gas, and the expenses of management and collection. The accuracy of this view, it was further contended, was decided by the Mersey Dock case. The only possible offer of tenancy must take the shape of an offer to collect the rates, and ample allowance for the remuneration of such an offerer was made, under the head of collection, in the deduction for managing and working charges. It was further urged, as supporting the valuation, that the fact that the net revenue was kept down artificially by the provisions of the Act excluding profits had the effect of also keeping down the valuation: and so, if a further allowance were made as for tenants profits, that would have the effect of an artificial reduction of the valuation in two ways.

Mr. McLaren, who appeared for the appellants, said that the Maryhill Company, which competed with the corporation for the supply of gas, was allowed by their assessor 20 per cent. in name of tenants profits, but, according to the valuation proposed by Mr. Dodds, they were to assume that a tenant would be willing to take over this large undertaking simply upon such terms as would allow him to receive 5 per cent. interest on his capital, with no profit over and above. The allowances already made for working charges and expenses were made in respect only of the necessary expenses of that nature, even under a supposed tenant, and that a further allowance must be made to remunerate him for his trouble of management, and to induce him to invest his capital in the undertaking.

The Lord Ordinary pointed out there was a distinction in the case of a corporation as compared with a private company, seeing that the former must limit the rates which they charge to what will pay.

In answer to a question from the bench, it was stated that the manager of the company received £1000 a year, the treasurer £700, and the town-clerk, for keeping the minutes, £250. His lordship thereupon remarked that there were a good many pickings, but probably they were indispensable.

Mr. Moncreiff said the corporation, after undertaking to pay annuities and so on, were to manufacture gas for the benefit of the inhabitants of Glasgow at cost price, and were precluded from making profits. A hypothetical tenant could only expect a return in the shape of allowance for his trouble, collecting the revenues and managing the concern, and the assessor had made a sufficient allowance for that.

The Parochial Boards also submitted appeals against the assessor's valuation of the Gas Commissioners undertaking as being too low. They maintained that, inasmuch as the commissioners got in their accounts at least half yearly, and would thus draw at the end of each six months a sum of £172,500, an allowance of 5 per cent. for the year on £115,000, as half of the working capital, was too much to enable them to carry on their undertaking, and that this per centage should be allowed over six months only. They also objected to the allowance for risk, on the ground that, under their Act, the commissioners were required in each year to lay on an assessment to cover their outlay, whether in the ordinary expenses of working or in making good stock damaged by accident; and so they truly had no risks. The total value of the gas-works, as brought out by the assessor, was £98,891, of which £32,109 lay in the barony, and £14,246 lay in the city parishes. The commissioners contended that the value should not exceed £71,058 9s. 10d., while the Parochial Boards said it should amount to £110,000.

His Lordship reserved judgment.

GLASGOW WATER-WORKS COMMISSIONERS, *Appellants*, *v.* DODDS, *Respondent.*

The Glasgow Corporation Water-Works Commissioners submitted an appeal raising the same questions as in the above case, and it was met by counter appeals by the Parochial Boards. The only additional facts and arguments stated in these appeals were—(1) That the Water-Works Commissioners levied their rate in advance, and so required no floating capital to enable them to pay current expenses; and (2) that a smaller per centage on this head was allowed in this case.

His Lordship reserved judgment in this case also.

EXETER POLICE COURT.—Monday, Sept. 20.

(Before Mr. Dymond, *Chairman, and a Bench of Magistrates.)*

CHARGE OF SUPPLYING IMPURE GAS.

The Exeter Gas Company appeared to answer two summonses, taken out by the corporation, for having unlawfully, on the 16th and 17th inst., supplied gas within the city and county of the city of Exeter which was not purified from sulphuretted hydrogen to the extent required by the Exeter Gas Act, 1865, contrary to the provisions of the said Act.

Mr. Gidley, town-clerk, in opening the case, said he was instructed by the Town Council to appear in support of a summons which had been taken out at their instance against the Exeter Gaslight and Coke Company, for infringing the provisions of the Exeter Gas Act by supplying the city with gas below the quality prescribed by that Act. That was a plain and simple statement of what was really a very serious matter. The fact was very well known to their worships and the citizens generally that the city had for a very long time past been afflicted at intervals with the presence of a most fearfully abominable stench. Rightly or wrongly, people had generally attributed the presence of this intermittent, but most nauseating, stench to some neglect on the part of the gas company.

Mr. Daw (who appeared for the company): I must ask my friend to confine himself to the summons. It is not usual to go into the history of the previous ten years.

Mr. Gidley said that might be so, but it all led to the summons. But perhaps he might as well adopt his friend's suggestion, the matter was so well known. Previous to the days mentioned in the summonses the smell had been so well known as to need no further comment. On the 16th of September this identical smell was perceived—not here and there, or at intervals, but almost universally throughout the city, penetrating people's houses, and actually, in the cases of some publicans, driving people away from the place. People who had heard the alleged origin of the previous smell so strenuously denied could scarcely think for a moment that this could arise from the gas company, who never created any offensive odour at all, and they thought it must be the drains. However, instructions were given to the gas inspector to test the gas supplied, and on applying the test prescribed by the Act of Parliament, he found from the effect produced on the test-paper that the gas did not fulfil the requirements of the Act of Parliament. The 61st section of the Exeter Gas Act provided—leaving out matters which did not affect the present question—that all the gas supplied by the company should be "so far pure from sulphuretted hydrogen as not to discolour moistened test-paper imbued with acetate or carbonate of lead, when the test-paper is exposed for one minute to a current of gas issuing under a pressure of 5-10ths of an inch of water." The 63rd section provided for the appointment of an inspector by the council, and the 64th that, if it was proved to the satisfaction of any two justices, not being shareholders in the company, that the gas was impure, then in any such case the company should forfeit any sum not exceeding £20, as the justices might determine. He referred to the obnoxious character of the smell just now, because he anticipated, from what he had heard, that part, if not the whole defence of the company would be that the presence of this sulphuretted hydrogen in the gas on the days named was due to an unavoidable accident, and he had no doubt that his friend would direct his attention to that in mitigation of the penalty. Upon paper it did not look a very serious offence that, for just 48 hours, owing to an unavoidable accident, certain impurities should be allowed to enter the gas; and it might appear

hard that, for such an accident, the gas company should be mulcted in very heavy damages. But this sulphuretted hydrogen, as their worships were no doubt aware from personal experience, produced an excessively offensive and repugnant odour, and its effect was very serious indeed when present in large quantities. The stink it produced was enough, not only to annoy residents, but positively to deter people from coming into a city where such scents were dispensed. He might say one word in reference to the test applied by the gas inspector. It fell short of the requirements of the Act in one particular—viz, in regard to the pressure of the gas at the time it was made. The pressure required by the Act was 5-10ths of an inch of water. Of course, if the pressure was beyond that point, more gas would be sent through the burner, and with more gas more of whatever impurity it might contain. The test was applied in the day, when the pressure was about one inch. The test-paper used on the occasion would be produced, and the bench would observe it to be very highly discoloured. The scientific witness who would be examined would tell them that gas which, at that pressure, contained sufficient impurity to produce such discolouration as that would, at a lighter pressure, not only produce such discolouration as the Act required, but a very serious amount indeed.

Mr. *F. P. Perkins* was then called. He said he was a gas inspector, appointed by the Town Council. On Thursday, the 16th inst., his attention was directed to the prevalence of a very noisome stench in the city, and, acting on instructions, he applied a test to the gas. The test he applied was for sulphuretted hydrogen. He moistened a piece of filter-paper with a solution of acetate of lead, and allowed a stream of gas from a burner to pass over it. The test-paper [produced] was exposed to the gas about half a minute, and the effect was to discolour it very much indeed. [The paper was handed to the bench, and it was noticed that the surface exposed to the gas was of a yellowish brown, it having been originally quite white.] He made the experiment about one o'clock, and at that time the pressure of gas was the usual day pressure of about one inch of water. Had the pressure been only half an inch, as required by the Act, the discolouration would have been slightly less, but still very strong. Witness made a second test about four o'clock the same afternoon under similar circumstances. [Test-paper produced.] On the 17th inst., at 3.30 p.m., witness again tested the gas, the conditions being the same as on previous occasions; and a fourth test was applied at six p.m.

Cross-examined: I made those tests in my own laboratory, not the Town Council's laboratory, nor in the Museum, but in my own house, No. 2, Upper Paul Street. I am in the employ of the Town Council. I have not my appointment with me. I do not think the pressure is more than one inch at six o'clock; it would be about 1½ inches at half past. I did not test the gas at the company's works. I have been in the habit of testing the gas four times a month for illuminating power, and once in two months for chemical impurities —oftener when I suspected anything wrong. I have never found sulphuretted hydrogen in the gas until this occasion.

Witness was asked whether the smell would be likely to be intermittent, if produced by this cause, and replied that if there was any leakage in the pipes the gas would of course be wafted about by the wind. The smell would be constant while the gas was turned on. The whole of the smell might not have come through the main; but what came in that way would not be intermittent.

By Mr. GIDLEY: The intermittent smell might have come from the works, assuming that the purifiers were carried into the chimney-shaft.

Mr. DAW: But you do not know there are any purifiers going through the shaft, and it is notorious there are none.

This was the case for the prosecution.

Mr. DAW said his defence was perfectly clear. The gas company were only summoned the previous night, and had had no opportunity of obtaining scientific witnesses. He might complain of undue haste, but his answer depended on the Act of Parliament, and he would make no further comment on that matter. Let them see what the Act required. Section 62 provided that the company should erect an experimental meter at their works, connected with the main, and not with a branch pipe, and went on to describe the apparatus. The 63rd section authorized the council to appoint as inspector, a competent person not an officer or servant of the council. The witness told them he was a servant of the council, and on that point the case failed at once. Then he was to test the gas at the company's works, and not behind their backs. The next section provided that if the gas, when "so tested," should be proved impure the justices might inflict the penalty. Another point in which the prosecution failed was in testing at a pressure of one inch instead of half an inch. He submitted first, that being a servant of the council, Mr. Perkins was not the proper person to test the gas; next, that he had not tested it at the company's works; and lastly, that he had not applied the test laid down by the 61st section. Under these circumstances no case had been made out for a conviction.

Mr. GIDLEY, in reply, said he had proved that the gas supplied to the citizens was impure; and argued that Mr. Perkins was a servant of the Museum Committee and not of the Town Council.

The bench retired, and after half an hour's deliberation returned into court.

The CHAIRMAN said: The bench have given this subject very careful consideration, and they have come to the conclusion that the gas supplied by the company on the two days mentioned in the summons was impure, and contained sulphuretted hydrogen; but at the same time they find that the test does not appear to have been applied in accordance with the Act of Parliament, and therefore with regret they feel compelled to dismiss the summons.

SUFFOCATION FROM COAL GAS.—On Thursday last an inquest was held by Dr. Thomas, deputy-coroner for Central Middlesex, at the Rugby Tavern, Great James Street, Bedford Row, London, on the body of Mary Harriss, aged 53, wife of an accountant. From the evidence of the deceased's husband, residing at 36, Great James Street, it appeared that he and deceased went to bed at one o'clock on Friday morning. They had had visitors, to whom they gave up their own bed-room, and went into another. In the latter room there had been a smell of gas for days previously. At four o'clock and about 5.15 he awoke, and spoke to his wife. On the last occasion, receiving no answer, he got up, and found her lying with her hand across the rail of the iron bedstead, with her face downwards. He removed her back to her proper position, and then heard her moan, and thinking she was in a fit, he sprinkled her face with water. He was himself partially stupefied, and fell off to sleep again, not waking up till seven o'clock. He then tried to rouse his wife, but as he could not do so he believed she was dead, and determined to call for assistance, but was unable to do so, and fell to sleep again, and did not wake till about half-past eight. He had then some slight recollection of being taken out of bed, but was not thoroughly recovered for an hour after. His cousin (one of the visitors) roused him, and on finding his wife dead, sent for a doctor, who pronounced life extinct some hours. He knew there was a smell of gas in the room, and intended to have it seen to, but thought he would rest another night. The cousin referred to said he went to the room and found the deceased dead and the husband partially insensible by her side. A gas-fitter, who had been doing some fittings in a room downstairs the day before, said he knocked up the piping from the ceiling which had been connected with a pendant. On examination of the piping under the floor of the room where deceased slept it was found that the connexion of the pipes was only made with white lead, instead of solder, and had been in that state for years. A slight cause would render the joints imperfect, and bring about an escape of gas. Dr. Lydall said the death had been caused by the inhaling of the fumes of coal gas, and the jury returned a verdict to that effect.

Miscellaneous News.

HARROW DISTRICT GAS COMPANY.

The Half-Yearly Meeting of Shareholders was held at the London Tavern, on Friday, Sept. 24—JAS. GLAISHER, Esq., F.R.S., in the chair.

Mr. J. L. CHAPMAN (the resident engineer and manager) read the advertisement calling the meeting, and the following report and accounts were presented:—

The directors are glad to be able to report that the working of the company during the past half year has been satisfactory.

The continued increase in the business and progress of the company has necessitated enlargement of the retort-house and other parts of the works; these are now being proceeded with, and will be, when finished, of sufficient capacity to meet for some time the demands of the district for the supply of gas. And in order to meet these outlays the directors feel it will be needful to ask the proprietors to sanction the issue of the remaining portion of loan on the original capital, either by way of mortgage or debenture stock, in such manner and at such times as they may deem best.

The gas-rental for the half year shows an increase of £400 as compared with the same period of last year, but in common with other gas companies the price obtained for coke has been very low.

The accounts of the company have been drawn up in accordance with the Act of Parliament, and represent the present financial position of the company.

The balance of profit and loss accounts shows a total of £795 0s. 9d. for disposal, and this sum the directors recommend should be dealt with in the following manner—viz.: £750 for the payment of a dividend for the past half year, at the rate of 5 per cent. per annum, and £45 0s. 9d. carried forward to the credit of the next account.

Dr. *Revenue Account for the Half Year ended June 30, 1875.* *Cr.*

Manufacture of gas—				Sale of gas—		
Coals, including all expenses	£1,177	9	4	Lady-day quarter—		
Purifying materials, water, oil, &c.	32	1	7	Private rental—		
Salary of engineer	75	0	0	4,461,900 cubic feet at 6s.	£1,338	11	10
Wages	251	7	9	381,900 do. do. 6s. 8d.	127	5	6
Works, machines, and apparatus—				Public rental and under contracts	147	14	6
Maintenance of, repairs, & labour. £75 1 8				Midsummer quarter—			
Less old material sold 11 11 0				Private rental—			
	63	10	8	2,072,300 cubic feet at 6s.	621	13	2
Distribution of gas—				147,000 do. do. 6s. 8d.	49	0	2
Mains and service-pipes, repairs, maintenance, renewal, and labour	10	6	0	Public rental under contracts	67	7	6
Meters, renewing, repairing, and refixing	7	12	6	Meter-rental—the half year.	60	1	0
Public lamps—				Residual products—			
Lighting	24	6	0	Coke less labour and cartage.	261	19	8
Rents, rates, and taxes—				Tar	78	1	10
Rents	16	0	0	Transfer fee	0	2	6
Rates and taxes	26	0	5				
Management—							
Directors and auditors allowances	110	10	0				
Salary of secretary	25	0	0				
Collector's commission	26	4	6				
Stationery and printing	6	18	1				
Gen. establishment charges	35	13	5				
Sundries—							
Bad debts	4	16	0				
Total expenditure	£1,892	16	3				
Balance carried to profit and loss account	859	1	5				
	£2,751	17	8		£2,751	17	8

The capital account shows receipts—ordinary shares, £30,000; loans, £5000; total, £35,000. Expenditure, £32,439 5s. 7d.; balance, £2560 14s. 5d.

The CHAIRMAN, in moving the adoption of the report, said the directors had great pleasure in meeting the shareholders, as there had been no drawback whatever in the working of the last half year. Previously the company had had difficulties to contend with, but he believed the worst had been passed, and they should continue to progress, not perhaps so rapidly as they could desire, but still in the right direction. Their proceedings since the date of the report now before the meeting sustained him in that confidence. The new gasholder, to which he referred on a former occasion, was now finished, and the directors were well pleased with it. It was a beautiful piece of work, and its acquisition removed one of the great anxieties of the board. They were now building a new retort-house, which when completed would be furnished with the best retorts of the present day. The company would then be in a position to do a largely increased business without the necessity for the expenditure of more capital, upon which point he was very jealous. Although as yet they had not attained to the payment of the 6 per cent. dividends anticipated in the prospectus of the company, he felt very strongly, as did his brother directors, in reference to the price of gas in their district. They were charging in Harrow 6s., and in the Sudbury district 6s. 8d. per 1000 cubic feet. The question had been carefully looked at by the board, and he hoped before long—probably not this quarter—they would see their way to make a reduction, which, while it would gratify the consumers, would not impair the prosperity of the undertaking. He should certainly hold up his own hand in favour of such a proposition at the earliest opportunity, for he believed that in the end it would lead to more business and greater profits.

The motion having been seconded, was put, and carried unanimously.

The CHAIRMAN then moved—"That a dividend at the rate of 5 per cent. per annum, free of income-tax, be now declared and paid."

The motion was at once agreed to.

Mr. RANDALL said he observed in the manufacturing account that during last half year 930 chaldrons of coke were made, and that of that quantity no less than 439 chaldrons were used in the manufacture of gas. He hoped a better return would be shown when the new and improved retorts spoken of by the chairman were erected.

The SECRETARY said the matter referred to by Mr. Randall had not escaped the attention of the directors. The retorts and settings at the works were very small and expensive to work; the new settings would greatly economize the fuel account.

A SHAREHOLDER said he felt sure it would be a wise policy on the part of the directors to reduce the price of gas. He was not a resident in Harrow, but in communication with friends there he learnt that there was dissatisfaction at the present charge, and that the inhabitants burned as little as possible in consequence. For himself he should be content with 5 per cent. if thereby the cost to the consumers could be reduced.

The CHAIRMAN said, when he was examined before a committee of the House of Commons on the company's bill, he stated that the price intended to be charged at the first was 6s., but that, as soon as possible, the company would reduce the price below that. If it had not been for the opposition to the company by the Harrow people, which resulted in an expenditure of £2000, the price might have been reduced even now. Notwithstanding this, he had always urged it upon his brother directors, and he knew it was their earnest wish to effect a reduction at the earliest possible moment.

Mr. PENNY thought the suggestion from the inhabitants of Harrow, that there should be a reduction of price, came with a very bad grace, seeing that the company were only getting 5 per cent. upon their capital. The board

should be very careful, in the interests of the shareholders, not to reduce the price if it imperilled the payment of the present rate of dividend. The inhabitants of Harrow had not been so considerate of the interests of the company as to make the shareholders enthusiastic about considering them. He was satisfied to leave the question with the directors, because there were residents at Harrow on the board who had the interests of the consumers, as well as the shareholders, at heart.

Mr. JAMES RANDALL was desirous that the question of a reduction of price should be favourably considered by the directors. The business of a gas company was very elastic; the interests of consumers and shareholders were identical, and experience generally proved that a reduction of price was followed by an increased consumption, which was more than proportionately remunerative.

The CHAIRMAN, in reply to an inquiry, said an Act was obtained last year for the construction of a railway to Harrow. At present not a sod had been cut, but it was to be hoped the work would ere long be taken in hand, for the benefit to the gas company in the reduced cost for carriage of coal, &c., would be very great.

The meeting was then made special, for the purpose of authorizing the directors to raise by mortgage, or by the creation of debenture stock at 5 per cent. interest, as they may think desirable, £2500.

The CHAIRMAN briefly explained the necessity for increasing the capital at the disposal of the board to the extent named, and a formal resolution, conferring the required authority, was unanimously adopted.

A vote of thanks was given to the directors for their services, which the chairman acknowledged.

Mr. JAMES RANDALL proposed a vote of thanks to the secretary, which was seconded by a DIRECTOR, and supported by the CHAIRMAN, who spoke highly of the services rendered by Mr. J. L. Chapman, and said the directors hoped soon to be in such a prosperous condition that they would be able to build a manager's house adjoining the works.

The vote having been very cordially adopted, the SECRETARY acknowledged the compliment, and the proceedings terminated.

ROCKHAMPTON (COUNTY LIVINGSTONE, QUEENSLAND) GAS AND COKE COMPANY.

The Half-Yearly Meeting of this Company was held in the Board Room at the Works, on Thursday, July 1—Mr. A. GRANT in the chair.

The following report and statements of account were presented:—

Report from the Directors to the Shareholders for the Half Year ended May 31, 1875.

1. During the six months the works have been in operation, many circumstances have arisen to retard the business of the company; yet notwithstanding the hindrances produced—through the floods and the unusual depression of trade in Rockhampton caused thereby—your directors feel gratified in being able to report that the business has shown a gradual increase, and has now reached a point at which it may be considered self-sustaining.

2. The balance-sheet already circulated shows a profit of £3 5s. 3d. for the half year; and this result, taking into account the price paid for coal and labour in starting the works, is more favourable than might have been expected.

3. The works are proved in every way to be substantial and sound; and there is now being erected a capacious coal-shed for the storeage of coal. This building was found absolutely necessary, as the deterioration of coals, when exposed to the weather, is found to be very great.

4. Dissatisfaction has been expressed by some consumers, that the cost of gas at 20s. per 1000 cubic feet, as compared with oil, is in favour of the latter; whilst others contend that gas is as cheap—taking due account of breakage of glasses, labour in cleaning, and the greater risk of kerosene. It well deserves the consideration of the shareholders to decide whether any reduction should be made in the price of gas. At the present rate of 20s. per 1000 feet, the works may be expected to pay expenses, and further ordinary increase would secure dividends; whereas, if a reduction be made, it will require much greater consumption than at present obtainable to make the works remunerative. Your directors are fully aware of the desirability of a liberal policy in this matter, but deem it right to point out that, in order to obtain any large increase of consumption, considerable outlay will be needed for the extension of mains, and that the company have already exceeded the amount of their capital.

You are now called upon to elect two directors in room of Henry Jones, Esq., and Alexander Grant, Esq., who retire by rotation, but are eligible for re-election. The following gentlemen have given the requisite notice of candidature—Henry Jones, Esq., Alexander Grant, Esq. Two auditors will also have to be elected for the ensuing year.

Balance-Sheet—Profit and Loss.

Manufacture, distribution of gas, and management	£767	7 4	Sales of gas, coke, and tar.	£808	17 9
Interest account	80	5 2	Scrip	3	10 0
Balance	8	5 3	Transfers	3	15 0
			Rents	39	15 0
	£855	17 9		£855	17 9

Liabilities and Assets.

A. J. S. Bank—				Fixed investments—			
Overdraft			£3,153 18 1	Land, buildings, machinery, mains, services, meters, implements, and furniture			£10,884 5 0
Capital	£10,000	0 0		Floating investment—			
Less due from shareholders	£1321 13 5			Coals, coke, and tar in stock			173 1 9
Less 106 forfeited shares	495 5 11			Sundry debtors*			287 17 3
	1,816 19 4						
	8,183 0 8						
Profit and loss	8 5 3						
	£11,345	4 0			£11,345	4 0	

* This includes gas-rents for May.

The CHAIRMAN, in moving the adoption of the report, said that beyond the mere formal business the chief thing to deal with would be the consideration of the advisability of reducing the price of gas. This question had already been before the directors, and they had agreed to take a vote of the shareholders in the matter.

Mr. CRUICKSHANK seconded the motion.

Mr. PATTISON, referring to the question of a reduction in the price of gas, asked the chairman whether he could give any information that might guide the meeting to a right decision.

The CHAIRMAN said the company were at present indebted, in round numbers, to the tune of £2000 or £3000. He apprehended that two or three times the present consumption of gas could be produced with the existing appliances, but to get extra consumption the mains would have to be extended, involving further indebtedness to the company.

Mr. SMITH (superintendent of the works), in reply to Mr. Pattison, said a considerable number of additional consumers might be supplied without any extra mains whatever. There were long distances in some streets where the mains were laid where there were no consumers, and without any fresh mains the company's works could easily supply 800 additional burners. After that came the question of providing for a still larger supply, if necessary, by extending the mains. The present appliances, however, were capable of producing three times the quantity of gas now required.

Mr. FORREST asked for information as to the items of expenditure, which he thought were very heavy for a small company.

The SECRETARY (Mr. Mills) said the directors fees were at the rate of £120 a year; salary of managing engineer, £300, secretary, £200; solicitors retainer, £25; fees to auditors, £12 12s.; town rates, £15; wages of three stokers, two guineas a week each, for seven days of eight hours—total 56 hours. There was also the cost of tools and repairs, and interest on overdraft which, during the past half year, had amounted in all to £182. The expense at the start had been greater than it would be in future. The heating of the furnace alone, before laying on the gas, consumed 25 tons of coal, and there were extra charges for wages and other outlay which would not occur again.

Mr. FORREST thought that £500 a year for secretary and engineer was out of all proportion to what was actually required.

The CHAIRMAN said the time of those gentlemen was fully occupied. The engineer worked as hard as any professional gentleman in the town, and the secretary did as much or more than any man in a similar office. He (the chairman) could not see how to dispense with these officers. If they were similarly situated as Parramatta, near a large city where engineers could be called in at any time, and anything done when required, the case would be altogether different. There were many things that required the constant attendance of an engineer, and the works had to be looked after and the business of the company attended to.

The motion for the adoption of the report was then put and carried unanimously.

The retiring directors and auditors having been re-elected,

The CHAIRMAN asked for an expression of opinion from the shareholders as to the propriety of reducing the price of gas.

Mr. PATTISON said, for his own part, he was satisfied with the present price, which, in his experience, was not much more than that of kerosene. But as some persons, whom it was desirable to secure as consumers, thought otherwise, he considered it would be safe to recommend the directors to try, as an experiment, a reduction of 2s. 6d. per 1000 feet. If that succeeded, and they found themselves able to proceed farther in the same course, they could afterwards do so. Perhaps this reduction would cause present consumers to use more gas, and induce others now using kerosene to become consumers. He would, therefore, move that it be a recommendation to the directors to reduce the price of gas to 17s. 6d. per 1000 feet until the next half-yearly meeting.

Mr. STEVENSON seconded the motion. After what Mr. Smith had said, that 800 more burners could be supplied without extending the mains, and that three times the present quantity of gas could be manufactured with existing appliances, he thought a moderate reduction might be made.

Mr. HARDEN differed from the opinions just expressed. No doubt there were people dissatisfied; but if the price were now reduced to 17s. 6d., the same people would, six months hence, want it brought down to 15s.

Mr. CRUICKSHANK, as a consumer and a shareholder, would recommend a sort of middle course, and thought they might meet the present difficulty half way by introducing a sliding-scale, which had been done with great success in Victoria and New South Wales.

The SECRETARY said it had been suggested to him by some shareholders that consumers of less than 1000 feet monthly should be allowed to remain at the present charge, with, perhaps, a reduction of 5 or 10 cent. on prompt payment; and there might be a larger discount allowed to consumers of from 1000 to 5000 feet, and a still larger discount to consumers of more than 5000 feet. Such a course had been adopted at Brisbane, and might, perhaps, be followed with advantage here.

Mr. CRUICKSHANK said he would move, as an amendment—"That, instead of a uniform reduction, a sliding scale be adopted, to allow of large consumers using gas more freely." In place of reducing the price to every one, he thought they should make a difference in favour of large consumers.

Mr. J. JOYCE seconded the amendment.

After some conversation the amendment was put and lost, only the mover and seconder voting for it.

Mr. HARDEN moved, as a further amendment, that the question of reduction be left entirely with the directors. If they saw their way to make a reduction they could do so. It was not well to relieve them from responsibility, as, if a difficulty occurred, they might turn round and say it was the shareholders own act.

Mr. PATTISON thought Mr. Harden could not have understood the motion. It only asked the directors to make a reduction. They would not do it unless they thought fit.

The original motion was put to the meeting and carried by a large majority.

A cordial vote of thanks was given to the directors for their services.

The CHAIRMAN, in acknowledging the compliment, said as one who had served on the board, and had just been re-elected, he was thankful for the kind expressions of the shareholders towards the directors. They had had great difficulties in bringing the company to its present position, more than was ordinarily experienced in the formation of companies, still he had no hesitation in saying that every care and precaution had been taken in the erection of the buildings and procuring the plant. And much was due to their engineer, who had displayed great ability, and had carried the works to completion without mishap or breakdown; and notwithstanding the difficulties attending the importation of plant and putting it together, all had been done satisfactorily without alterations or extras. The buildings and plant were substantially put together, and in good order. They had been able to light up at once, and the work under Mr. Smith's superintendence had been a great success. Now he hoped that the reduction decided upon would prove satisfactory to the consumers, and that they would take kindly to work and consume more gas.

WALSALL GAS SUPPLY.

A Town Meeting was held in the Guildhall Assembly Room on Monday evening, Sept 21—the MAYOR presiding—for the purpose of passing resolutions authorizing the Town Council to promote a bill in Parliament enabling them to arrange with the Corporation of Birmingham for the transfer of that portion of the Birmingham and South Staffordshire Gas-Works Company's plant and property within the borough of Walsall upon certain conditions, and also to include within the municipal borough that portion of the parish of Rushall within the jurisdiction of the Improvement Commissioners of Walsall.

The MAYOR stated that by a recent Act of Parliament a corporation could not go to Parliament unless the consent of the owners and occupiers of property within the borough had been given. Some time ago many of the owners and occupiers of property in Walsall authorized the Town Council and the commissioners to oppose some clauses in the bills which were then being promoted in Parliament, the result of which was the elimination of certain provisions which would otherwise have proved inimical to the town of Walsall. From a statement made by the Mayor of Birmingham, there was perhaps a feeling that the Corporation of Walsall had agreed to give more than it was worth for the plant of the Birmingham and Staffordshire Gaslight Company, that gentleman having stated that the company had only made £800 a year. The value, however, was not to be estimated by what that company did, but by what the plant could do; and then it must be borne in mind that the company had to sell to people who were their own gas-makers, and who had learned the art so thoroughly that they could make it cheaper and better than any one in the world. He concluded by moving a resolution empowering the council to promote a bill for the acquisition of the property on the terms agreed to.

Mr. BROWNHILL seconded the motion, and said that if the worst came to the worst, provided that this arrangement was carried out, it would pay; and if the best came to the best, they would make an income that he estimated at from £8000 to £9000 a year. With the present works they had made in five years £15,500, and that, too, with gas at 2s. 1d., 2s. 2d., and 2s. 5d. per 1000 feet. The purchase from the Birmingham Corporation was of property worth £25,000, and then there was in addition main power that he considered quite worth the

extra £7000 that was being given. He had gone fully into the question, and was well satisfied that it would be successful.

The motion was put and carried unanimously.

The MAYOR then moved a resolution sanctioning the proposed transfer.

The TOWN-CLERK (Mr. S. Wilkinson), in seconding the resolution, gave a detailed statement of the manner in which the gas-works had been conducted in the past, and pointed out the disadvantages they had had to contend with, and the advantages that would accrue from the carrying out of the proposed arrangement. He said the works had cost £53,000, of which only £11,000 was now owing, the difference having been made as profit by their works, and so paid off, and this, too, at a price which, when compared with 12 of the chief towns of the Midland Counties, showed one-third in favour of Walsall. The average in those towns was 3s. 4½d., and in Walsall it was 2s. 3d., so that the inhabitants had really been receiving a dividend which was equivalent to about £8000 a year. Or, to put it another way, they had gained what was equal to a yearly rate of 3s. in the pound. The gas-works had cost £53,000, but they had always hitherto been in danger of being crushed by the rich corporation—the Birmingham Gas Company—with which they competed until this arrangement was made. Now that that was removed, their value might fairly be put at £100,000, especially when they found that the shares of that company, which only paid 10 per cent., were worth more than double their original price. The whole debts of the borough, including that on the gas-works, were about £52,000; so that by completing this scheme, which had been most carefully considered and prepared, the town became possessed of about £50,000 worth of property in excess of everything they owed.

A third resolution was also adopted on the proposition of the MAYOR, seconded by Mr. LINDOP, in favour of the incorporation of that portion of the parish of Rushall which is within the commissioners district within the borough.

SWANSEA GAS SUPPLY.

A Special Meeting of the Swansea Town Council was held on Wednesday, the 22nd—the MAYOR (Mr. F. A. Yeo) in the chair, to receive the minutes of the Gas Committee, presented on the 8th inst., recommending the corporation to apply to the Local Government Board for authority to borrow money for the erection of new gas-works in accordance with plans approved by the committee.

The MAYOR stated that he had received a letter from Mr. Church emphatically denying that his late father had ever seen or approved of plans for the erection of works in Swansea to supply 200 million cubic feet of gas annually for the sum of £48,000.

Alderman J. J. JENKINS, by whom the statement was reported to have been made at the last meeting, now stated that he was aware the late Mr. Church died in May last, before the estimate for the works was laid before the committee, and moreover he had never stated that Mr. Church did approve of it. [The *Cambrian* report of the council meeting on the 8th inst. stated that "on the assurance by Alderman Jenkins that the estimates had been approved by the first engineer, Mr. Church, now deceased, Mr. James Rogers withdrew his amendment.] What he (Alderman Jenkins) said was, that according to his opinion and judgment, the estimate referred to would bear favourable comparison with Mr. Church's, inasmuch as at the time Mr. Church made his estimate, iron pipes were up to £9 15s. and £10 per ton, whereas they were now down to £6 10s. Therefore he thought he was justified in saying that one estimate confirmed the other, more especially as Mr. Church's estimate was for lighting the whole of the borough, whereas that which the committee brought up and recommended was for lighting the town and franchise only. The real estimate of Mr. Church, prepared in 1874, was £82,300, and taking that, for the sake of argument, as the cost of erecting works to supply the same quantity of gas as was now supplied by the company, he maintained that if the corporation charged only 4½ per cent. upon the capital, they could supply gas to the inhabitants at 3s. 01d. per 1000 feet; if 5 per cent., at 3s. 96d.; and if 6 per cent., 3s. 2d. per 1000. He (Alderman Jenkins) could not see, in all that had been written on this subject, one argument to refute the statistics he had brought forward. The Swansea public ought not to be charged more than 3s. per 1000; and, whatever was the result of the present meeting, he would never rest until, by some means or other, the price was brought down to that sum. For himself, he believed in the capacity of the person by whom the £48,000 estimate had been prepared; but, perhaps, before that large expenditure was made, it would be well to convince the public mind that the works could be carried out for the sum named. He understood there was to be a proposition made to the meeting for a conference with the gas company as to a reduction in the price of gas, and several of his friends thought it would be better to defer a decision, on the recommendation of the committee, until after that interview. If the directors refused to reduce the price within fair and proper limits, it would then be for the council to decide upon the erection of new works. He would formally move the reception of the minutes, but not with the intention of having them carried out until the figures were verified.

Alderman FORD seconded the motion.

Alderman JENKINS said he ought to have stated that Alderman Phillips, not as chairman of the gas company, but as a large shareholder, told him that the directors were quite prepared to meet the corporation, and discuss the question fairly, and, under the emergencies of the case, to make some tangible reduction in price.

Alderman FORD said he had gone into the question fully, and believed every figure brought forward by Alderman Jenkins could be verified, and that works could be constructed for the town and franchise for the £48,000.

Mr. J. ROGERS, after referring to the report of his speech at the last meeting, the accuracy of which he denied, said he thought it would be very imprudent, in the present condition of the manufacture of gas, to go largely into a competing establishment, even assuming the estimate given in by the Gas Committee was correct. He moved, as an amendment to Alderman Jenkins's motion—"That a deputation, consisting of the mayor, Aldermen Jenkins and Ford, and Messrs. Evans and Rogers, be appointed to confer with the directors of the gas company, with a view to an arrangement for a supply of gas at a more reasonable tariff." He believed this would meet the views of the council. After all said and done, it would be a great inconvenience to have competing gas-works in the town. They had also a moral obligation towards the existing company. If it was not at the time expressly stated, he had no hesitation in saying it was understood that the corporation were amply satisfied with the clauses inserted in the company's Act, and it was upon that understanding their capital was subscribed. They were bound, therefore, to respect the monopoly of the company, so long as it was not exercised to the disadvantage of the public. He complained that "a personal element" had been made the moving power in the agitation against the company. He did not wish to impute such a motive to any gentleman in the council, but it had been out of it. He had no doubt Alderman Jenkins was perfectly conscientious in what he did and said. He had no doubt also that gas could be produced cheaper than the present price; but he had grave doubts whether it would be prudent to establish new works simply for the sake of saving the difference between 4½ per cent., at which the corporation might be able to raise capital for the purpose, and 7½ per cent. paid upon the company's capital. He hoped the motion would be withdrawn, and the amendment carried unanimously; that the company would meet the corporation fairly, and that thus, for the present, the question would be settled.

Mr. EVANS seconded the amendment, and expressed a hope that further discussion would be deferred until after the proposed interview with the directors.

Alderman JENKINS being appealed to, said he would withdraw the motion if Mr. Rogers would withdraw his name as a member of the proposed deputation.

Mr. ROGERS said he did not see why he, because he took one view of the question, had not as much right, and was not quite as fit, to take part in the deputation as Mr. Jenkins, who took the opposite view of the question.

Alderman FORD said he should not oppose the amendment, but he would ask the chairman of the company for an assurance that the directors would meet the deputation.

Alderman PHILLIPS said he was in a position to say that the board of directors were quite prepared to meet them. He was prepared with statistics in reference to Mr. Church's estimates, but he would delay reading them till a future time.

Mr. HARVEY, who, at the meeting on the 8th, spoke of a saving of 25 per cent. in the cost of gas at Paddington, having been effected since the works there "had been in the hands of the corporation," now corrected himself by saying that the saving was effected, not by "the corporation" taking the works, but by the vestry of the parish having adopted the average meter system to the public lamps. He strongly urged that the system should be adopted in Swansea.

Mr. R. HUGHES supported the amendment, remarking that a reduction of 1s. per 1000 feet would effect a considerable saving to him at his works.

Mr. J. GLASBROOK said he had fought a hard battle to become a director of the gas company, solely with a view to obtaining a reduction in the price of gas. As far as he could see, there appeared some hopes of gas being made there as cheap as at any other place, and he would not rest satisfied—in fact, he would give up his position as a director—if he could not get it cheaper. At the same time, he remarked that cheap gas would only benefit the tradesmen of the place, and that the best thing for the corporation to take up would be a colliery, because that would benefit everybody. Mr. Jenkins might move for the acquisition by the corporation of a large colliery, in order to supply the town with coal at 1s. per ton cheaper.

After a few remarks from Mr. CROWHURST,

Alderman JENKINS said he would withdraw his motion until after the meeting with the directors of the gas company.

The MAYOR said he did not believe the directors would be so impolitic, much less so discourteous, as to refuse to meet the deputation. He only hoped good would result from the interview. Putting the question on that narrow basis, even the difference between 4½ and 7½ per cent. on the capital would not be so inconsiderable as Mr. Rogers appeared to think. It would be £6200—nearly one rate a year.

The amendment, having become the substantive motion, was then put and carried.

DUNDEE WATER SUPPLY.

FURTHER TESTING OF THE PIPES AT LINTRATHEN.

The *Dundee Advertiser* states that on the 17th inst. the Water Commissioners paid another visit to Lintrathen for the purpose of seeing the test applied to the pipes between Lintrathen and Pitnappie. The water, which had been allowed to flow slowly through the pipes for some time previously, was, about eleven o'clock, when the sluice at Pitnappie was put down, confined to the pipes. For some time after the water in the measuring cistern at Lintrathen showed no signs of rising, but about half-past one when the flow from the loch into the cistern, which up to this time had been only at the rate of 40 feet a minute, was increased to 200, it began gradually to increase. Inch by inch it rose for an hour thereafter, till it had gained nearly two feet, when all at once it suddenly subsided, and the jets, which could previously be seen rising several feet into the air from the air-valves on the heights at the other side of the river, disappeared. This at once apprised those in attendance that an accident of some sort or other had occurred. Nothing could be done but wait the tidings which would be brought as to where this had taken place. None being received, the party started at five o'clock to drive along the road, and had only proceeded two or three miles when a messenger met and informed them that one of the pipes had burst. An adjournment was made to the spot, which was near Jordanstone, about 200 yards to the south of where the burst took place on Tuesday. When there it was found that the force of the water had been so great that it had driven out the whole of the side of a pipe 1⅜ inch thick, raised the earth all around, and scattered it a considerable distance. The gauge at the Isla was not working well, and it is not known exactly how much pressure would be on when the pipes burst, but to all appearance it was not so high as it attained on Tuesday ere the one on that occasion gave way. It not being possible to do anything further that night, the party drove to Dundee. No arrangement has yet been arrived at as to when another attempt is to be made to have the test applied.

WEST OF SCOTLAND ASSOCIATION OF GAS MANAGERS.

The Seventh Half-Yearly Meeting of the above Association was held on Thursday, the 9th of September, at 11 a.m., in the Guildhall, Stirling. Mr. WILLIAM DUNLOP (Hamilton), president of the association, occupied the chair.

ADOPTION OF MINUTES.

The minutes of the last annual meeting, and of subsequent meetings of committee, having been read by Mr. JAMES M'GILCHRIST, secretary,

Mr. D. M. NELSON (Glasgow) moved that they be adopted, and, in doing so, said that he had seldom listened to minutes, extending over so many meetings, which so fully set forth what had been done.

Mr. JAMES M'EWAN (Gourock) seconded the motion, which was unanimously approved of.

ADMISSION OF NEW MEMBERS.

The CHAIRMAN intimated that the following gentlemen had been proposed as members of the association:—

David Coates Niven	Gas-Works,		Dunoon.
P. A. Black	Joint-Stock	„	Falkirk.
Samuel Dickson	„	„	Kilsyth.
Peter Watson	„	„	Stirling.
James Henderson	„	„	Maryhill.
James Matthews	„	„	Fraserburgh.

On the question being put to the meeting, it was unanimously resolved to elect the above gentlemen as members.

THE CHAIRMAN'S ADDRESS.

The CHAIRMAN thereafter addressed the meeting as follows:—

Gentlemen,—I come before you this morning, under a deep sense of my inability to discharge fully the duties devolving upon me as your president.

Being persuaded that the qualifications required by the president of an association such as this must be of more than the ordinary grade, I feel not a little uneasy in my present position.

In opening the proceedings of the day, permit me at the outset to thank you for the very great honour you did me at your meeting in April last in choosing me to be your president, and allow me to assure you that nothing shall be wanting on my part to increase the prosperity and usefulness of this association.

It is not my intention this morning to detain you with a lengthened disquisition on any *one* subject, but simply to bring before you (in as little space as possible) a few of the more striking improvements in gas manufacture and engineering which have been suggested in the meetings of other and kindred associations, and to introduce to you the subjects for to-day's consideration.

Since last we met, our friends across the border have had their annual meeting (this year at Leeds).

The papers read and discussed by members of that association were of more

than ordinary interest, they were unquestionably of a superior quality, and, did time permit, deserve more than a passing notice from us. In the first place, I would take the liberty of making a few observations on two of these papers—viz., those of S. H. Warren, of Crewe, and W. Cleland, of Liverpool; the former on "Mechanical Stoking," and the latter on the "Economy of Force in Gas-Works, in Reference to Condensing and Exhausting."

Let me, then, in the order mentioned, take up these subjects.

Mechanical Stoking.

Numerous have been the inventions patented and fitted up, with the view of doing away with skilled labour in gas-works. These have been varied as they are numerous, and ingenious as they are varied.

The original design of the machine, invented by Mr. Green in 1860, was to reduce the possibilities of sudden stoppages through the combination of a class of workmen who have not (as you are all aware) been, as a rule, easily dealt with.

Having this end in view, the mechanical stoker was brought into requisition, and, in some cases, it has wrought with a degree of ease and smoothness, speed and perfection, which we could scarcely have accredited.

Some of these stokers (as already hinted) are, without a doubt, striking pieces of mechanism, and have performed the discharging of the retorts gracefully and with remarkable rapidity.

But this, I am sorry to say, cannot be affirmed of the process of charging by such machines, but the contrary; for, since their introduction in 1860, there has always been some little obstruction to hinder the free working of them in this direction, and has, of course, caused no little trouble and annoyance to those in the management.

Their liability to get out of order has also proved a great drawback to their introduction into small gas-works, where there is a difficulty in securing engineers for their repair.

From a description given in the JOURNAL of Messrs. Warren and Wates's improved stoker, it appears to be of very simple construction, and in no way cumbersome.

The only objection which can be urged against it is the motive power, which is an endless rope. This cannot be so safe a method as if it had been wrought by hydrostatic pressure.

There can be no doubt that the more rapid the means employed in charging and discharging retorts, the greater will be the quantity of gas produced, while the illuminating power will be slightly increased.

To my mind, however, there will require to be a modification of the retorts, as well as considerable improvements made upon the "stokers" in general, before these machines can undertake to fulfil the purpose for which they were invented; and, until some improvement is effected on them, the day of their introduction into gas-works, and more especially works like ours, is far distant, or, at the best, the work of their adoption in small gas-works will be a tardy one.

Gas Exhaustion.

In the paper read by Mr. W. Cleland, of Liverpool, he describes his process of relieving the pressure on the retorts by means of the "steam-jet exhauster," which, from simplicity of construction and cheapness in working, ranks well among other gas exhausters.

It appears to me that gas exhaustion is only in its infancy. It is but emerging from its secluded position into a more open and developed state, but yet far from perfection.

And why has this important portion of the gas apparatus been so much neglected? Why is it so defective?

It is simply because, while engineers have been expending time and talent upon branches of the profession which have reached a greater degree of perfection, they have overlooked this important part, either from the impression that they were unable to solve the difficult problem, or from the opinion that it was of little consequence.

Gas exhaustion, in my opinion, has not been the subject of real, thorough investigation, otherwise the carbonaceous deposit which presently adheres to the retort would have been totally removed. From the nature of our present apparatus we can only bring down the pressure to that of the atmosphere, and when this is done, the accumulation of carbon on the retorts is still going on, although in a lesser degree. Were it possible to relieve the pressure of the atmosphere altogether, so that there would be a perfect vacuum in the retorts, this deposit of carbonaceous matter would, in my opinion, cease, and thus our work would be facilitated, and our revenues increased. But seeing that, practically, we cannot accomplish this desired object, and are totally at the mercy of the pressure of the atmosphere for the amount of pressure under which we are compelled to carbonize our coal, my belief is that we should turn our attention to other means of removing this nuisance of a deposit. There is no doubt that the exhauster is of considerable advantage in relieving the working pressure, and I believe the steam-jet one of the best forms for the purpose, always provided that the results shown have not a deleterious action on the illuminating power of the gas.

One difficulty, however, appears in this steam-jet exhauster—viz., the liability of the steam, after having done the work required of it, to condense some of the valuable hydrocarbons, and thereby reduce the illuminating power of the gas.

Should this be the case, I am inclined to think that Mr. Cleland's process would not be found more profitable than any of the other exhausters of older date. But on the other hand, should this not be so, then I most unhesitatingly say that this will be found one of the best exhausters ever brought before us.

Having thus brought under your notice the subjects of two of the papers read at the recent meeting of the British Association of Gas Managers, I would next call your attention to the report of the proceedings of the meeting of the North British Association of Gas Managers, held at Dundee lately.

It is indeed gratifying to see that association in such a flourishing condition; and by the number and quality of the papers which have been contributed by its members this year, we may infer that it has a most prosperous future in store.

First, and in a word, I would refer to the paper read by Mr. Macpherson, of Kirkcaldy, on "The Relation which exists between the Durability and the Bromine Tests and the Illuminating Power of Gas as expressed in Standard Candles."

The table drawn up by him exhibits a great amount of labour and study, and reflects much credit on the author.

In all our methods of testing, I believe there are many defects, so that it is only by having several modes of proving the results that we can arrive at anything like a fair conclusion.

The other paper by the same gentleman, on "Tanks in Concrete," must engage the attention of most managers, from the fact that they can be built very cheaply, do not require to be puddled, and are found to be very durable.

It is only to be regretted that Mr. Macpherson was unable to give the exact cost of the work per cubic yard.

May I express the hope that the author of that paper will be able, by next meeting of the "North British," to give the information desired?

We now come to the business of to-day.

I am indeed glad to see our membership increasing meeting by meeting. Two years ago our numerical strength was comparatively small, but it is with much pleasure I now state that we are 140 strong. This surely must be due to the benefits derived from our meetings, and from the exertions of individual members.

From the minutes of committee it will be observed that we have had several meetings, at which almost all the committee were regular in their attendance. This, I think, is but another token of the interest taken in the society by the members of your committee.

The secretary in his report mentions that, in the various applications for relief from the "Benevolent Fund," Rule 14 has been strictly adhered to, being confident that it is only by the rigid enforcement of it they can extend a helping hand to the deserving.

We next come to the "Annual Report of the Gas Manufacture of Scotland," which we regretted last year led to disagreeable misunderstandings, in consequences of managers putting different constructions on the various queries. When brought before our meeting at Lanark, your committee promised to revise the matter; they have now done so, and it will be laid before you for your consideration. The schedules they have made up along with the proposed instructions, on which I hope each member present will express his views.

You will observe, from the circular sent you, that the next subject for discussion is our three-year-old friend, the Malam process, which, seeing it has been so often before us without coming to any definite conclusion, I do hope we shall be able to-day to make such arrangements as shall lead to its approval or condemnation.

I am sure we shall all be very much pleased if Mr. Malam can show us that, by the use of the highly-heated coke, and the water passing through his stand-pipes, he is able to supply us with a process to produce an increased quantity of gas without proportionately reducing its illuminating power. My own opinion is that there is a fixed temperature for the distillation of coal for the production of the maximum quantity and quality of the gas; and I am further convinced that, if we are to obtain a larger yield of gas and an increased illuminating power, we must do so by adding hydrogen by the decomposition of water, and thereby take up the naphthas from the tars in an undecomposed state. While on this subject, I wish to draw your attention to what I believe a popular error in reference to the Scott process. In the presidential address, delivered before the British Association at Leeds, by Mr. Paterson, referring to Mr. Scott's process, he described it as being somewhat similar to that patented by James Young, in 1854, and also that of Mr. Malam, whereby the gas is made to pass over or through incandescent coke, the object being solely to decompose the tar.

In both of the processes the gas is taken off at the end of the retort, after passing through the heated coke; whereas I consider the most important feature in the Scott process is the fixing of the outlet at the middle of the retort.

The quenching of the coke in the water-trough at the bottom is made to supply steam, to be decomposed, in its passage upwards through the incandescent coke, into hydrogen and carbonic oxide; at the same time it meets the richer gases and vapours from the fresh charge before it leaves the retort, and thereby supplies the want to which I have previously referred—viz., the supply of hydrogen to take up and suspend the vapours of the hydrocarbons in the tars.

I have already taken up so much of your valuable time, that however much I may desire to say a few words on the subject which is further to engage our attention to-day, I will defer any remarks I have to make till we see what time is to be at our disposal.

ANNUAL REPORT.

The chairman said that the next business before the meeting was the annual report; and he might say that some new questions had been added, the effect of which would be to make the report of more benefit to gas managers in general, and to all gas companies. The best way to deal with the queries would be to go over them *seriatim*, and as he read, if there were no dissentient voice he would hold the report as adopted. The questions were as follows:—(1) Town, (2) Population, (3) Manager, (4) Area of carbonizing surface. We have a rule here for the guidance of gas managers, and it is this: The area of carbonizing surface is the total internal surface of retorts sufficiently highly heated to produce gas. Thus, a retort, say, heated for 8 feet of its length, and having a circumference of 4 feet, would give $8 \times 4 = 32$ feet carbonizing surface, and nine such retorts would give a total of 288 superficial feet. (5) Pressure on retorts. That is, pressure on the hydraulic mains, with the amount of dips on stand-pipes added. That can be easily ascertained by placing the pressure-gauge on the hydraulic main. (6) Area of condensing surface—condensing surface to embrace hydraulic mains, condensers, and all pipes connecting the same; or, in other words, all surfaces by which the gas is reduced in temperature. Thus, say hydraulic main, 30 feet long by 5 feet circumference = 150 feet; piping from hydraulic to condensers, 20 feet × 2 feet = 40 feet; pipes, 180 feet × 1 foot 6 inches = 240 feet; chest, 8 feet × 2 feet × 1 foot 6 inches = 62 feet; total condensing surface, 362 feet. I may add that we merely give out something for a small work; but with this statement any one will be able to do the work properly.

Mr. NIVEN: I think it might do quite well to take the condensing surface from where it leaves the hydraulic main.

Mr. YOUNG (Clippens): There must be some fixed mode of getting calculations; and in order to that, I think it would be as well to include all surfaces wherever the gas is reduced in temperature. If the statistics were properly compiled, it would be a most valuable document.

Mr. M'GILCHRIST: If the hydraulic main is on the top of the retorts, there would not be much condensation in that vicinity; whereas if it is, as in some works, 10 or 12 feet away, there would be a greater amount of condensation. From the first I have always considered that it would be best to take the calculation from the pipes leading from the hydraulic mains, because if the ascension-pipe crosses the retort-house, as in some cases it does, considerable condensation will take place in these pipes.

Mr. YOUNG: The condensation will be very limited in the stand-pipes, because we have always more or less of a deposit on the internal surface of these pipes, which is almost a non-conductor.

Mr. NIVEN: I think it should simply be where it leaves the hydraulic.

The CHAIRMAN: It is the surface which comes in contact with the atmosphere which we want.

Mr. M'GILCHRIST: Then there will be some works where more tar is to be found in the hydraulic main than in others.

Mr. YOUNG: We have the tar to cool as well as the gas, and if the gas does not come in contact with the surface, the tar does; so there is not the least doubt that there will be a certain amount of condensation in the hydraulic, and that is proved by the considerable quantity of tar which is got from the hydraulic. I believe that, under ordinary circumstances, the half of our tar comes from the hydraulic.

Mr. M'EWEN: How would that refer to a hydraulic on the top, and within 6 inches of the main flue?

Mr. YOUNG: In that case the condensation would not be to the same extent; but if not, it would be doing quite as good work by keeping the gases heated, and allowing them to deposit their tarry matters much more freely, and therefore, although it did not cool the gases, it would prepare them for being much more actively cooled when they entered the condensers.

Mr. M'LEOD (Glasgow): One object the association is aiming at is to have a uniform rule that every work should adopt, and although there may be minor differences from the position of the hydraulic, yet were these differences so important as to lead them to reject the rule? A uniform rule, so that there should be no discrepancy in the calculation, is a desirable thing; and I suppose, if this rule is adopted, every manager will get a copy of it?

The CHAIRMAN: That is our intention, and it is very important that managers

should be in harmony on this point. I think that all surfaces that are acted upon by the atmosphere should be taken into account.

Mr. NIVEN: From the report issued last year it does not appear that many managers care about signing them.

Mr. YOUNG: I think that may be accounted for in this way. Proper directions had not been given as to how they should be filled up, and, rather than risk the committing a blunder, they withheld the information.

Mr. NIVEN: There are other reasons than that.

After some further conversation,

The CHAIRMAN said: There are no other objections to this rule, and there is only the recommendation of our friend from Airdrie that the area of the hydraulic main be dispensed with. In the instruction we will insert, "from the hydraulic main," and that, I think, meets the views of most members present. The 7th question has reference to the capacity of condensers. The capacity of condensers is the quantity of gas required to fill all parts of the apparatus in which the gas is cooled. This may be ascertained by a calculation, thus:—Hydraulic main, 30 feet long; area of space above water-line, 1·25 feet = 37·5 cubic feet; pipe from hydraulic to condensers, 20 feet long × ·50 inch area = 10 cubic feet; condensers, pipes 180 feet long × ·28 foot area = 50 cubic feet; and chest, 8 feet × 2 feet × 16 × 1, say above tar surface = 16 cubic feet; total, 113·5 cubic feet. This is merely the quantity of gas required to fill the apparatus from where we have taken our former calculation—that is, the area of the pipes from the hydraulic main till it leaves the condensers, including box and everything. It is the internal measurement.

Mr. YOUNG: The object of the former question is to ascertain the surface, and of the present one to ascertain the capacity of the condensers. Suppose we have two sets of condensers, one with a small and the other with a large internal capacity, yet having the same cooling surface—say, in the one case, the condenser was composed of 4-inch and the other of 8-inch pipes—it is evident that, for equal areas of surface, there will be only half the capacity in the smaller pipes, and that in passing equal quantities of gas through both sets of condensers, the gas will require to pass at double the velocity through the smaller sized pipes; and consequently, although we have the same cooling surface, yet we have not the same condensing power, for we all know that gases, when kept in rapid motion, have the power to carry forward tarry particles mechanically suspended, and that unless they get rest somewhere these particles are not properly deposited. Where there is a condenser of large internal capacity, the gases travel so slowly that at each turn of the chest they deposit their tarry particles; whereas, if they are driven with great velocity, they swirl round and carry on the tarry deposit, and some of the material which should have been removed by the condensers would find its way to the trays of the purifiers, close up the lime, and prevent it having its proper action on the gases.

The CHAIRMAN: The next question is as to the capacity of scrubbers. The capacity of scrubbers is the cubic contents of the vessel, so far as it is filled with coke, boarding, or other material over which the water is spread to bring it into contact with the foul gas. Thus, say the scrubber is 12 feet high, and filled with coke 10 feet, and, diameter, say, 4 feet; then 4 feet × 4 feet = 16 × ·7854 = 12·57 × 10 = total, 125 cubic feet. Of course, it is not the full internal capacity of the scrubber, but only from where the water comes into contact with the crude gases. The next question is as to the area of washers. The area of washers is the superficial area of the plate for distributing the gas and causing it to come into contact with the water. Thus, say a round washer having a plate 5 feet diameter, 5 × 5 = 25 × ·7854 = 19·63 superficial feet.

Mr. RICHMOND (Whitburn): Do you measure from the top to the bottom of the washer, or from the water into which the pipe dips?

Mr. YOUNG: In the washer it is the plate which makes the gas travel in contact with the water, and in taking the washer we take the superficial area of the plate by which the gas is brought into contact with the water.

The CHAIRMAN: I think that is all that is needed to make our calculations. It is only when the crude gases come into contact with the material used that we are to fill in.

Mr. YOUNG: There is another way in which we may overcome this difficulty. Suppose that a manager did not see his way to complete the necessary calculations, if he would supply the mere measurements of the various parts of his apparatus, the committee would make the necessary calculations, and fill in the schedule for him.

Mr. RICHMOND said that in his works he had a washer, in which the pipe was made to dip only a short distance into the water.

Mr. YOUNG explained that, in such a case, what required to be measured was the superficial circumference of the pipe which dips into the water. As that was all the means employed to bring the water and gas into contact, it was immaterial how deep the water was. No doubt the upper surface of the water would have a certain washing power, but it would be very feeble.

Mr. BRODIE (Paisley) suggested that Mr. Richmond should get a perforated screen of wire netting fixed round the dip-pipe in his washer, as by that means the washing power would be very much increased.

The CHAIRMAN: The next question is as to the total area of purifiers. The area of purifiers is the superficial area of the top trays in all the purifiers. Say there are two purifiers, 8 feet × 6 feet. That would give 48 feet as the superficial area of each purifier. Two such purifiers would give a total area of 96 superficial feet: and say each purifier is provided with four trays, two of which are used for oxide of iron and two for lime, and that each material is placed on the trays to the thickness of 6 inches, then there would be four trays for oxide of iron, with a total of 24 inches, and four trays for lime, with a total thickness of 24 inches. There has been some misunderstanding with regard to the depth of lime used. Some argued that it was the depth of one purifier, whereas it was the depth of the whole material used. The following questions have reference to the capacity of holders; the maximum daily make—that is, the greatest amount made in 24 hours; annual manufacture; length of main-pipe per consumer—that is, to get the length of the mains divided by the number of branches you have, and this will be very valuable if it can be accomplished. It will be very easily done where there are survey-maps.

Mr. YOUNG: And where there are no maps, there will be few managers unable to spare time to step over their mains and arrive at a pretty correct result.

The CHAIRMAN: The next is, Consumption of gas per consumer—average night pressure on mains; and that has a good deal to do with the unaccounted-for gas. This return will be a very important one, if the members will kindly fill up the schedules. I do not suppose there will be any gas-works without pressure-gauges. Their average day pressure on mains, leakage, or gas unaccounted for.

Mr. YOUNG: These three questions bear on the leakage very materially. In the first place, we have the length of main per consumer. If we have a great length of main and few consumers, we must have an extra amount of leakage. Then, in cases where the pressure has to be kept on during the day, to fill a gasholder placed at a distance from the works, the leakage, as we all know, is in the exact ratio of the pressure; and, consequently, from this cause, the leakage would be much increased. It is also material that we should have the average day and night pressure, as in many cases gas managers have not the power to check pressures. I was much struck, in this connexion, with the state of Stirling. At the bottom of the hill on which the town stands they are working from 5 to 7-10ths pressure, and yet at the top they have some 3 or 4 inches. As, with these gradients, a great number of governors are required to equalize the pressure, there will be great leakage in the upper half of the town as compared with the lower half, unless a series of governors are employed to reduce and equalize the pressure.

Mr. RICHMOND: In small works, such as ours at Whitburn, there are no governors.

Mr. BRODIE: I think that the society should impress upon every member the importance of having governors, because there is not the slightest doubt that these small works which have no governors, by getting them would save their price in a year.

Mr. RICHMOND explained the difficulty under which he laboured in having to keep a holder, situated about two miles away, constantly full, and said that he was under the necessity of keeping up the pressure night and day.

Various means of remedying the defect were suggested, but some of them Mr. Richmond had tried, and found them to be unavailing.

Mr. D. KEITH (Barrhead): We had a holder such as Mr. Richmond speaks about, which was filled during the daytime. The connexion was by a 2-inch pipe. Well, we lifted that pipe, and laid down a 4-inch pipe, and the price of these pipes was saved in a year. If at Whitburn they were just to double or treble the size of the pipes, they would effect much good.

Mr. RICHMOND: That is my idea; but the distant holder belongs to a different company, and there is some difficulty.

Mr. BRODIE also spoke as to the great saving in regard to leakage which would be effected by putting on governors.

The CHAIRMAN: The next question is leakage, or gas unaccounted for. In making this calculation, managers are to add to the gas registered in consumers meters an estimated quantity as used in the works, and by deducting these from the gas made, the desired conclusion can be easily arrived at. The next question is the price per 1000 to ordinary consumers and to public lamps as at the 31st of November. We will get these printed, and issue them to all the gas-works in Scotland, and trust that managers will use their best efforts to afford reliable information.

MALAM'S PATENT.

The CHAIRMAN: I have a telegram from Mr. Malam, which is as follows:—"Just arrived home. Have no statistics to give, as the notice has been too short. Process working well." I may mention that we instructed the secretary to write to Mr. Malam before we issued the circulars, and I think he might have had time to get up something. I learn from the secretary that intimation was given to Mr. Malam on the 28th of August.

Mr. YOUNG: Independently of that, Mr. Malam might have come, for he had sufficient notice at the last meeting. It was well understood that this meeting was to be principally devoted to the discussion of the Malam process; for at that meeting, Mr. Nelson asked Mr. Monk to repeat a series of questions he had made to him by letter some time previously. The latter gentleman then said that he was not prepared to do so, not having anticipated such a request, but promised to take up the subject at the next meeting, and he has now prepared a paper on the subject, which he proposes laying before the meeting.

The CHAIRMAN: Perhaps Mr. Nelson, being agent for the patentee, has instructions. (Addressing Mr. Nelson:) Have you any instructions from Mr. Malam?

Mr. NELSON: Not specially.

The CHAIRMAN: A good many of the members have come here on the understanding that the Malam process was to be fully discussed.

Mr. NELSON: I do not think this is a question as to Mr. Malam's presence or absence; it is a question as to his process. The question at issue is altogether a chemical one. *Can* it be, or not? Those who do not understand the chemical action of the process will just have to wait until his experiments are completed. The process is being experimented upon in various parts of this country and in Paris, and, until the results are arrived at, you cannot blame Mr. Malam. It is not a question to sit and ponder about at such meetings as this. I must say that the reception which Mr. Malam has got, and the reception which his patent process has got, has been, to my mind, not at all complimentary, and has not been at all in accordance with that spirit of inquiry which should characterize an assembly such as this, met, as it is, to eliminate what is good from patents such as this. I know that this question has been prejudged, and has been spoken of in a disparaging manner by men who do not know anything of the chemical action which takes place in connexion with the Malam process.

Mr. YOUNG: If Mr. Malam thought as you think now, he ought to have withheld the remarks he made at our last meeting; and he ought not to have invited discussion, and then refused to give an opportunity for that discussion taking place. Who is to answer any questions which may be put if the patentee is absent? I do not think that any one should take up the matter unless he is present.

Mr. NELSON: It is not in Mr. Malam's power to be present at every meeting of this association. I have a private communication from him. I am not instructed to make it public, but I shall simply do so if it is the wish of the meeting. I may also say that, while I have to do with the process, I have nothing to do with Mr. Malam's personal conduct. I do not wish to question the rightfulness or wrongfulness of Mr. Malam not being present. All that I have to do with is, that the patent process is being proceeded with; and I think there was a little undue haste on the part of our president when he stated, in his inaugural address, that a matter which had been started in 1860 was not yet perfected, and when he spoke of the Malam process as their three-year-old friend. It is a chemical process, which cannot be wrought out in a day; and, if it has the merit that is claimed for it, considerable time will be necessary to arrive at a proper result. In the communication which I received from Mr. Malam yesterday, he states that he has nothing definite to give. At Enniskillen they will not allow reports to be made public unless they have some scientific witnesses. He says: "In France they were to have made other final tests on Monday last, and I expect the results every day. They will be published in the JOURNAL." He states the quantity they have taken out is of good illuminating power, but does not give any definite information to form a comparison. Then he goes on to say: "In Dumfries my directors have stated, in their report to the company, that it has worked most satisfactorily, and that will be found when Mr. Foulis comes from Glasgow." He further says: "I have written to Mr. Foulis, and told him that he should give me a few days notice, as I may be from home. . . . It is a pity the Stirling meeting is so soon. . . . . But I am now in a position to make gas in Dumfries without any deterioration, as Mr. Foulis will prove; and, if any company shall try my process and fail, I shall not receive any charge for my patent right. I could leave it to the most scientific to judge that my plan of carbonizing is the best out at the present day, for it can be so regulated by the amount of coke left in the retort as to take off any quantity required, without any stoppage."

The CHAIRMAN: Mr. Nelson has made allusion to my remark about the patent of 1860. That stoker, I think, was abandoned after trial.

Mr. NELSON: We cannot debate your address. You stated that a patent stoker had been introduced in 1860, and since then had been in process of being perfected—that is to say, since 1860 there had been little improvements in any stoker.

The CHAIRMAN: I stated that the first was patented with a view to a certain object.

Mr. NELSON: And that it was far from perfect.

The CHAIRMAN: I stated that there had been plenty of patent stokers. In 1838, something similar to the plan proposed by Mr. Malam was patented by Kirkham and Lowe; and in 1845 a similar patent was taken out by James Young, the only difference in the patents being that he (Mr. Malam) used water in the ascension-pipes. That he has now abandoned. It is only on the

outside that he adheres to the water. So it seem to me that Mr. Malam's patent is just a repetition of the patents of Kirkham and Lowe, and James Young.

Mr. NELSON: It is not for me to talk on such matters with practical gas makers. All I have to do is, as a legal counsel would say, to watch the proceedings.

The CHAIRMAN: Have you instructions to watch the case on his behalf?

Mr. NELSON: In a matter of this kind I do not take instructions from anybody. My identification with the process is a matter of principle, and not merely a commercial speculation. I am here also because I consider it the duty of every one connected with such a matter to bring it out and see that it is perfected, and if it is to do good, to assist as far as possible in its introduction; and if it turns out a failure, I shall be the first to say that I have misplaced my confidence. So far as it has gone, I have no reason to think there will be any failure in the Malam process.

The CHAIRMAN: He seems to have abandoned it to its fate.

Mr. YOUNG: If we are to go into the question, we should do so in a fair and legitimate manner. We should not make it a personal affair, but an affair of the association. I do think, however, that Mr. Malam should have been here to represent the process. It was offered to us as a perfect process, and it was offered for sale. Now, a process under these conditions should be in such a state that the association could come to a decision in reference to its merits, either to adopt or reject it. Mr. Nelson said it was a chemical question, but practically I have to point out that we are as far forward to-day as we were when Mr. Malam first introduced his process. If we go into the question, we ought to be in the possession of such information as would enable us to come to a decision at once, one way or the other.

The CHAIRMAN: I may say that Mr. Monk has taken great pains to get up a paper on this subject, and we must all be sorry that Mr. Malam is not present to answer any questions contained in that paper. Perhaps Mr. Nelson would take it upon himself to answer anything?

Mr. NELSON: I am afraid that you misunderstand my position in connexion with this Malam process. I have got to do simply with the commercial part of it. I have nothing to do with the chemical facts. That is a phase of the process which should be committed to higher hands than those assembled at this meeting. Those who will give a decision in this matter will be people apart from gas manufacture, men of high chemical reputation, and who will have no prejudice one way or the other. Until that is done we may meet and discuss the matter, and arrive at no proper result. But this should not deter Mr. Monk from reading his paper.

Mr. YOUNG: Mr. Nelson says that this question must be decided by people better able to judge than we are, and if that is the case, I fail to see any object to be gained by discussing a matter which we cannot appreciate. The question, he says, must be decided by some high chemical authority, but I rather think that will meet with little encouragement from practical chemists and gas engineers. I think that Mr. Malam would succeed better by asking that the matter should be decided in a good practical way, or as Mr. Townshend of Glasgow would say, by "school" chemistry, not in the laboratory. What we want is a process that any ordinary labourer can go into and work. We must have the thing done in such a manner that no high chemical attention is needed to make the process a success.

Mr. NELSON: I am quite at one with Mr. Young as to the practical means of proving this to the general satisfaction; but he is proceeding too hurriedly. Neither Mr. Young nor any gentleman present has taken the trouble to make any experiments, and I do not see how we can deal with the process in a practical way. Until scientific reports are obtained, we cannot say much, for we have no firm or solid foundation to make experiments upon; and if we fail we can say that we have been led on by those who ought to have known better. I do not speak disparagingly of gas managers. If I wanted a practical test, I would go into a country town and get the man who had worked his way from being a stoker to make it. I would not go to a high chemical authority for such a test.

Mr. MONK: We do not propose to condemn the Malam process, we only propose to consider it; and if you have no objection, I am very anxious to go into the subject. I am anxious to get all the information I can upon the subject. I wish to reconstruct my retort-bench, and I have been waiting 18 months for something definite, if the saving should only be of 1000 feet at the point of consumption. The paper I have prepared is a review of the whole subject, and I do not think its discussion will be unfair to Mr. Malam, as Mr. Nelson said he undertakes the responsibility of watching the case.

Mr. NELSON: There is a misapprehension as to my presence here. I am no more committed to Mr. Malam, being here, than I was before. I find it to be my business to attend such meetings. I have business apart from Mr. Malam's process. If I interfere in this matter in the way of discussion, it is not because I am in the employ of Mr. Malam pecuniarily or any other way; but if I do speak on the subject, it is only because I feel inclined to do so, and as a member of this association.

Mr. JEFFREY (Kirkintilloch): We want information in regard to this process, and I think it is too bad of Mr. Malam not to be here.

Mr. M'GILCHRIST: More especially after he promised to be present.

Mr. NELSON: Those who know Mr. Malam personally will see reason for his not being here. He is about the last man to take part in a debate. He is no speaker, and he takes a roundabout way of expressing himself; and I am not sure but that it is more from that characteristic than from any other that he is not here. I know he has a decided objection to discussing the matter. He is more inclined to experiment.

The CHAIRMAN: For my part, I think we should delay discussing the question, seeing Mr. Malam is not present to answer any questions. It is hard for members to come here in expectation of hearing results, and then for Mr. Malam not to appear.

Mr. NELSON: I think it would be showing disrespect to Mr. Monk not to hear his paper, whether Mr. Malam is present or not.

The CHAIRMAN: It is essential that Mr. Malam should be present to answer questions in Mr. Monk's paper.

Mr. NELSON: I do not know what the paper contains; and, although I am not the mouthpiece of Mr. Malam, I will tell anything I know likely to enlighten those who are here.

The CHAIRMAN: I think it would be trifling away our time going into the question in this style in the absence of Mr. Malam. I think it would be better to go on with the other business.

Mr. NELSON: To do anything of the kind is quite contrary to your constitution. As a member, I shall dissent from your departing from the programme. I ask you to request Mr. Monk to go on with his paper.

The CHAIRMAN: I think I should take the mind of the meeting. Those in favour of Mr. Monk's paper being read will hold up their hands.

Only four responded to this request; but the negative question was not put to the meeting. The chairman was inclined to rule that the paper should not be read.

Mr. NELSON: I protest against our president putting himself forward to suppress ordinary business. Whatever your views on the Malam process may be, I certainly will demur to your occupying a position detrimental to the interests of this association. We are here as members to discuss subjects on the programme, and, as president, you have no voice in the matter.

The CHAIRMAN: All parties not being present, that cannot hold good.

Mr. YOUNG: I think it will lie considerably with Mr. Monk, if Mr. Malam has not had the courtesy to be present, whether he reads the paper or not. My opinion is that Mr. Monk's paper may come in much better at some other period, and that in the meantime we should appoint a committee to take up the matter, and see what can be done.

Mr. NELSON: Well, if we do not listen to Mr. Monk, we certainly show disrespect to that gentleman.

Mr. MONK: I think it will be much better that I should read the paper for the consideration of the members of the association and the gas world generally.

(To be continued.)

FIRE-CLAY AND OTHER REFRACTORY MATERIALS.

[A Paper read before the Iron and Steel Institute at Manchester by GEORGE J. SNELUS, F.C.S., Associate Royal School of Mines.]

It will be admitted by all concerned in the manufacture of iron and steel, that it is of the utmost importance to obtain good materials for building their furnaces, while at the same time it can scarcely be said that our knowledge of refractory materials is in a satisfactory state. With these convictions, the writer ventures to place the little information he has been able to gather upon the subject before the Iron and Steel Institute, with a view of eliciting discussion, in the hope thereby of increasing the general stock of knowledge.

Although it is generally allowed that the ultimate chemical composition of a brick does not altogether decide its fire-resisting property, yet, it is often possible to judge from a chemical analysis whether a clay will answer for a given purpose or not,

Thus it is found that the presence of alkalies in sensible quantities, say, about 1 per cent., confers so much fusibility upon a clay as to render it unsuitable for very high temperatures. This is well seen in the analyses of clays from the Dowlais and the Newcastle district. The Dowlais clays, numbered 9 and 10, contain respectively 1·43 per cent. and 1·13 per cent. of potash, and though bricks made from these clays are used for forge purposes, yet they will not stand above one month in mill furnaces, whilst bricks from clays 11, 12, 13, and 14, last for three months.

Mr. Pattinson believes that it is chiefly owing to the presence of a rather large proportion of alkalies that the Newcastle bricks are less refractory than the Stourbridge.

Lime and magnesia exercise a fluxing effect when present, but when mixed with silica, as in the Dinas bricks, a small quantity of lime is useful as a binding material, as it can be more intimately combined with the particles of quartz than any other similar substance.

Oxide of iron also exerts a fluxing effect, though in a less degree. It will be noticed that none of the Stourbridge clays contain over 2 per cent., but if alkalies are absent, iron oxide may be present up to about 3 per cent. without affecting the fusibility of the bricks in a very serious degree. This may be seen by a reference to the analyses of the well-known Glenboig bricks, and of the St. Helen's bricks. Blocks from St. Helen's last well in the hematite furnaces of West Cumberland. The writer has found these bricks to bear the scouring action of the highly basic slag of a Bessemer furnace better than those from the Leeds district. If, however, the brick is required to stand the intensely high temperature of a steel melting furnace, even this small proportion of oxide of iron becomes injurious.

Alumina appears to be singular in its action, for while it is well known to be one of the most infusible substances in nature, and the compound Bauxite, and also highly aluminous clays, as for example the Glenboig, and notably that from the large fire-brick works in Maryland, are highly refractory, and ordinary clay, containing less alumina, is less fire-resisting, yet when alumina exists in small quantities in silica bricks, it appears to increase their fusibility. This may be seen by reference to the tabulated analyses and remarks attached.

The plasticity of a clay depends on the presence of combined water, and to some extent upon the proportion of alumina. Thus the Glenboig clay, which contains a rather large proportion of alumina, is frequently of such a soapy character that it is used instead of soap for washing the hands. The well-known porcelain clay or Kaolin is highly aluminous, and is prized chiefly for its very plastic nature.

These properties cause the clay to shrink much in drying and firing, but after having been highly fired the material then suffers much less change of volume by subsequent changes of temperature. Hence it is that Glenboig bricks expand and contract so little upon heating and cooling, thus rendering them valuable in situations where changes of form would cause serious inconvenience, as in the regenerators and roofs of Siemens furnaces.

Silica is also a highly infusible substance, but unlike alumina, its particles have no tendency to adhere or bind together except under the influence of the most intense heat. When, therefore, this material is used for making bricks, a building substance has to be mixed with it. This is the case in the manufacture of the Dinas, or silica bricks, which were formerly made from the Dinas rock, to which a small portion of milk of lime was added. It is now found that these bricks can be made from any pure siliceous stone, by grinding it up and mixing about 1 per cent. milk of lime with it.

In the case of the ganisters, now so largely used for lining Bessemer converters, the cementing material is alumina, which is found naturally combined with the silica. But in this case the physical condition of the substance is of great importance, because it is used in the raw state, or at least without undergoing the process of burning. It is, therefore, important, that while it should not shrink much on heating, it should yet bind well together.

The peculiar black ganister of Sheffield possesses these properties in a high degree, and the writer has found none better than that sent out by Mr. Lowood. The rock itself appears to have been subject either to extreme compression or to heat, as it has a peculiarly close texture. Sheffield has, however, by no means a monopoly of this substance, or at least of materials that answer the purpose, as Dowlais and Ebbw Vale are now both making their own from local sources. Even pure quartz rock can be made to answer, by mixing a proper proportion of aluminous clay with it. Where, however, the natural black ganister can be obtained, nothing can answer better for all purposes.

There is another peculiarity possessed by silica, which is, that bricks made from it expand when burnt, so that in making silica bricks the moulds must be smaller than the bricks.

Thus, for a 9-inch brick, the mould would only be about 8¾ inches long. Every mixture, like every clay, has its own factor of expansion or contraction for the same amount of burning, but this is either increased or diminished by variation in the intensity of heat applied. The clay from which the St. Helen's bricks are made shrinks considerably during drying and burning. Thus, for a 9-inch by 4½-inch by 2½-inch brick, the mould is 9⅝ inches by 4⅞ inches by 3⅛ inches. For Glenboig clay, a shrinkage of one-twelfth is allowed, that is, the mould for a 9-inch brick is made 9¾ inches long.

Silica bricks not only expand during burning, but do so still more upon being subject to intense heat, contracting again on cooling; and this expansion and contraction is one of the most important points to take into consideration in building steel-melting furnaces. At Dowlais, the man in charge of the furnaces is expected to slacken the tie-rods above the furnaces while the heat is getting up, and to tighten them as it goes down, so as to follow the expansion and contraction of the roof. At Crewe it is attempted to make this self-acting, by the use of volute springs between the brick staves and the nuts on the tie-rods passing through them; while at Creusôt they try to make the furnace casing so strong (by the use of wrought-iron girders for brick staves, and very strong tie-rods), that the centre of the roof must rise and fall to allow for the expansion and contraction.

Mr. Riley states that, when at Dowlais, he found the quantity of iron made in a puddling furnace was directly as the per centage of silica in the clay used for making the bricks.

Titanic acid has been shown by Mr. Riley to exist in nearly all clays, but it does not appear to influence their fusibility in any marked degree, and it probably plays the part of silica, to which it is closely allied in all its properties. As much as 1 per cent. was found in Stourbridge bricks, but only traces in silica bricks.

It need hardly be pointed out that it is not sufficient to have a good material. Great care must be exercised in manipulating it. If it is to be made into a brick, every pains must be taken to dry it gradually, and to fire it evenly, and to a proper point; while, if it is to be used in a semi-plastic state, as in the state of ganister, it should be equally moist throughout, so as to dry evenly, and not so wet as to cause it to crack, or so dry as to prevent it binding.

But there is another practical point in the management of fire-bricks which is too often overlooked. Bricks are very porous bodies, and absorb a great deal of moisture, even when under cover, and, of course, much more if allowed to get wet. In fact, apparently dry bricks often contain a good deal of water, and if put into a furnace in this state, and the heat is got up rapidly, the bricks crack and crumble to pieces. This is especially the case with silica bricks, and the writer has known instances of bricks being condemned as chemically bad, when the fault lay with those who used them without properly drying them. It is well in the case of silica bricks to actually set them as hot as they can be handled. In all cases when a furnace is first started, and especially with Siemens furnaces, a very small fire should be kept up for several hours and then very gradually increased. This plan will add weeks to the life of these furnaces.

A careful study of the accompanying tabulated analyses, and of the remarks attached, will be well repaid, as they embody the results of much practical experience.

REFRACTORY MATERIALS.

Progressive Number.	—	Silica.	Alumina.	Peroxide of Iron.	Lime.	Magnesia.	Potash.	Soda.	Loss on Calcination.	—
1	Fire-bricks . . .	64·80	33·40	Trace.	·80	Trace.	1·00		..	Made at Broughton Moor, near Workington, Cumberland.
2	,, . . .	62·10	33·10	3·00	·90	,,	·90		..	,, Dunnachie's, Glenboig, Scotland.
3	,, . . .	63·80	31·00	2·80	·60	·75	1·05	Alkalies and loss.	..	,, St. Helen's, near Workington, Cumberland.
4	Bessemer tuyeres .	64·90	30·90	2·60	·40	·25	·95		..	,, Mason's, Horwich, near Bolton.
5	,, ,, . .	58 90	39·30	Trace.	·70	·36	·74		..	,, Peaks, ,, ,,
6	,, ,, . .	67·70	27·10	4·05	·30	Trace.	·85		..	,, Dunnachie's, Glenboig, Scotland.
7	Ganister . . .	89·55	4·85	·85	·60	·11	·94		3·10	Ganister, from Grayson, Lowood, and Co., Sheffield.
8	Fire-bricks . .	62·50	34·00	2·70	..	..	·80	..	..	Made at Dunnachie's, Glenboig, Scotland. Analysis by Prof. Abel.
9	Fire-clay calcined .	67·49	27·05	1·99	·43	·94	1·43	..	..	From Blaen-Rhos and Pant-y-Waun, Dowlais.
10	,, ,, . .	69·53	23·37	1·67	·37	·65	1·13	..	..	,, Ffos-y-fran, Dowlais.
11	,, ,, . .	63·74	29·65	2·64	·94	·87	·35	..	..	,, Cwmbran Clays.
12	,, ,, . .	72·46	25·06	1·17	·33	·31	..	..	..	,, ,,
13	,, ,, . .	67·22	29·03	1·32	·38	·37	..	..	..	,, ,,
14	,, ,, . .	63·78	32·69	2·14	·49	·49	..	..	..	,, Blaendare clay.
15	,, ,, . .	65·75	30·14	2·21	·58	·43	1·24	..	..	,, Three-coals, clay, Dowlais.
16	Fire-bricks . . .	67·87	27·96	2·35	·64	·29	..	..	..	,, Blaendare.
17	,, . . .	69·50	27·52	1·90	·32	·10	..	..	..	,, Stourbridge.
18	Ganister . . .	84·85	8·15	3·22	·78	·45	·35	..	2·93	Hollis, Sheffield.
19	,, . . .	94·00	4·51	1·22	·31	Trace.	·58	..	..	Hirwain, made near Aberdare.
20	,, . . .	83·15	8·10	4·02	·53	·41	·33	..	3·36	From Sheffield.
21	,, . . .	93·00	4·05	1·75	·35	·52	..	..	..	Hirwain, made near Aberdare.
22	,, . . .	93·02	3·36	1·39	·16	·14	..	..	1·50	,, ,, ,,
23	,, . . .	82·94	10·48	2·96	·42	·38	..	..	2·75	From Sheffield.
24	,, . . .	88·36	7·00	2·00	·22	·15	..	..	2·32	Grayson, Lowood, and Co., Sheffield.
25	,, . . .	88·22	6·83	2·07	·74	·26	..	..	2·35	,, ,, ,,
26	,, . . .	89·04	5·44	2·65	·31	·17	..	..	2·30	,, ,, ,,
27	,, . . .	87·51	7·85	2·00	·10	Trace.	..	..	2·90	,, ,, ,,
28	,, . . .	93·5	4·23	·80	·26	,,	..	..	1·00	Dowlais, ganister.
29	,, . . .	..	7·80	..	·28	·10	..	..	2·10	,, ,,
30	Silica bricks . .	95·53	3·26	..	·99	·42	..	..	..	Bad.
31	,, . . .	97·50	1·70	..	·55	·22	..	..	..	Good.
32	,, . . .	95·60	3·22	..	·97	..	..	..	..	Bad.
33	,, . . .	95·48	3·44	..	1·02	·20	..	..	..	Glyn-Neath brick. Stood badly.
34	,, . . .	95·51	2·90	..	1·08	..	..	..	..	Allen's. Stood moderately.
35	,, . . .	95·64	3·72	..	·95	..	..	..	..	Frederick and Jenner's. Stood badly.
36	,, . . .	95·15	2·41	..	2·14	..	..	..	..	Jenkins' brick.
37	,, . . .	96·58	2·43	..	1·01	..	..	..	..	Dinas special brick.
38	,, . . .	94·92	2·83	..	1·58	·21	..	..	..	Jenkins.
39	,, . . .	95·63	1·93	..	1·93	·20	..	..	..	,,
40	,, . . .	95·45	1·98	·45	2·06	..	..	..	..	,,
41	,, . . .	95·11	1·83	·55	2·10	·15	..	..	..	,,
42	,, . . .	94·85	2·00	·57	2·11	·15	..	..	..	,,
43	,, . . .	95·21	2·29	·56	1·68	·12	..	..	..	,,
44	,, . . .	97·5	1·4	·55	·15	·10	..	..	..	Dowlais brick.
45	,, . . .	..	2·1	..	1·28	..	..	..	..	,,
46	,, . . .	95·4	2·15	..	2·08	..	..	..	..	,,
							Phosphorous.	Moisture.		
47	Farewell rock . .	95·50 in.	1·94 / 1·20	·31	·25	·33	·05	·07	·52	Analyses by Mr. J. C. Needham, communicated by Josiah Richards, Esq.
48	Trevil stone . . .	80·16 ,,	9·70 / 5·55	·35	·20	·76	·09	·70	3·80	
49	Ganister	83·95 ,,	8·71 / 3·20	·35	·25	·50	·08	·35	3·25	
							Potash.	Soda.		
50	Fire-bricks . . .	60·53	33·28	2·61	·47	·64	2·05	·48	..	Newcastle fire-bricks.
51	,, . . .	58·00	36·50	1·67	·50	·90	2·12	·30	..	,, ,,
52	,, . . .	55·67	38·87	1·67	·58	·82	2·11	·21	..	,, ,,
53	,, . . .	63·82	31·68	1·63	·40	·70	1·85	·18	..	,, ,,
54	Fire-clays after calcination . . .	68·97	27·20	1·77	·74	·47	·62	·24	..	Stourbridge fire-clay.
55	,, ,, . .	69·32	26·44	2·00	·32	·50	1·10	·25	..	,, ,,
56	,, ,, . .	77·63	19·48	1·29	·18	·31	·52	·39	..	,, ,,
57	,, ,, . .	70·20	26·77	1·63	·30	·48	·50	·22	..	,, ,,
58	,, ,, . .	70·47	26·23	1·47	·21	·61	·66	·25	Water & Organic Matter.	,, ,,
59	,, ,, . .	75·50	21·37	1·42	·90	·34	·33	·14		,, ,,
60	Ganister	95·85	2·15	·38	·38	·25	Trace.	·27	·80	Ganister stone from the neighbourhood of Wolsingham.
61	,, ...	97·31	1·61	·19	·22	·09	,,	·18	·20	From the neighbourhood of Wolsingham.
62	Fire-clay	90·38	6·03	·90	·29	·15	,,	·31	2·13	
63	,, ...	79·81	12·44	·78	·41	·24	·63	1·59	4·27	German make.
64	Silica bricks . .	96·00	3·75	·55	·50	..	..	..	..	,,
65	,, . . .	95·50	3·00	1·00	·75	..	..	..	..	English make.
66	,, . . .	94·20	2·78	·82	2·30	..	..	..	..	Brick of Ponsard's regenerators, made at Paris at M. Müller's.
67	,, . . .	67·50	32·25	?	..	..	..	..	..	
68	Best fire-clays . .	58·00	30·85	1·55	·80	..	..	..	9·70	French, of Normandy.
69	,, ,, . .	58·80	28·03	2·47	1·15	..	..	..	10·50	Belgian, of Ardenne.
70	,, ,, . .	48·00	37·70	3·00	1·50	..	..	..	12·00	German, of Frankenthal.

Analysis by Mr. G. F. Dowsar.

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Communicated by John Pattinson, Esq.

Communicated by John Pattinson, Esq.

Communicated by Mr. A. Greiner, of Seraing.

No. 1.—This is a very white fire-brick, and stands well in plate-mill furnaces. Not very hard.
,, 2.—These bricks are red, with black specks. They are very hard and strong. They are largely used for the chequer work of Siemens furnaces, as well as for the furnaces themselves. They stand for twelve months or more in steel-rail reheating furnace.
,, 5.—These tuyeres are very white, somewhat crumbly, but, like No. 4, stand very well. It will be noticed that the alumina is very high.
,, 6.—Similar to the bricks in appearance. They are somewhat more fusible than 4 and 5, but are harder, and are difficult to cut out after use.
,, 7.—A dark-coloured ganister, binding well. Converter bottoms from this have gone a maximum of 25 blows with 6-ton charges, and average pillar of blast, 18 lb. Used entirely at West Cumberland Iron and Steel Works for Holley's dry bottoms, yielding an average of about 14 blows under above-named conditions.
,, 9, 10, and 15.—Used at Dowlais for making bricks for forge purposes, but do not stand very well, lasting only one month when used for mill furnaces.
,, 11, 12, 13, and 14.—Bricks from these clays last about three months in mill furnaces.
,, 17.—Stourbridge bricks used at Dowlais for building No. 19 blast furnace.
,, 28.—Dowlais ganisters. When used for "bottoms" it is simply ground without any admixture. For lining vessels a little clay is added, by which the alumina is increased, as shown in No. 29.
,, 36.—Stood for two months in the roof of steel-melting furnace.
,, 37.—Stood well.
,, 38 to 43.—Stood well generally, some roofs standing as many as 300 casts.
,, 44, 45, 46.—Made at Dowlais from a conglomerate sandstone in the Millstone Grit formation, just above the Mountain Limestone. The bricks average about 150 casts.
,, 48, 49.—Used at Ebbw Vale. Mr. Josiah Richards says: "I find a mixture of 1 part Trevil Rock and 4 ganister stone equal to Sheffield ganister for converter bottoms. The stone is found cropping out near the Trevil Mountain in three distinct layers, averaging together about 3 feet. The stone directly under it is quite soft and useless. It is under the seam of coal called the 'old coal,' 5 feet 6 inches thick. It is some 25 yards above the Farewell Rock or Millstone Grit series. In one pit where this coal is worked at a depth of 300 yards, the stone from under it did not do at all for ganister, as it contained too much alumina."

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

Address to the Chemical Section, Sept. 26, 1875.

By A. G. Vernon Harcourt, M.A., F.R.S., F.C.S.,
President of the Section, and one of the Metropolitan Gas Referees.

To the privilege of presiding over this section custom has added the duty of offering some preliminary remarks upon the branch of science for whose advancement we are met.

In discharge of this duty some of my predecessors have reviewed the progress of chemistry during the previous year; and until a few years ago there was no more needful service that your president could render, though the task of selection and abstraction was one of ever-increasing difficulty. But a few years ago the wisdom and energy of Dr. Williamson transformed the *Journal of the Chemical Society* into a complete record of chemical research, and this association materially promoted the advancement of science when it helped the Chemical Society in an undertaking which seemed at one sime hopelessly beyond its means. The excellent abstracts contributed to the journal err, if at all, on the side of brevity, and yet the yearly volume seems to defy the bookbinder's press. I shall not venture to attempt further abstraction, nor to put before you in any way so vast and miscellaneous an aggregate of facts as the yearly increment of chemistry has become. The advancement of our science—to borrow again the well-chosen language of the founders of this association—is of two kinds. The first consists in the discovery and co-ordination of new facts; the second in the diffusion of existing knowledge, and the creation of an interest in the objects and methods and results of scientific research. For the advance of science is not to be measured only by the annual growth of a scientific library, but by the living interest it excites, and the number and ardour of its votaries. The remarks I have to offer you relate to the advancement of chemistry in both aspects.

One fact has been brought into unpleasant prominence by the *Journal of the Chemical Society* in its present form—namely, the small proportion of original work in chemistry which is done in Great Britain. All who are ambitious that our country should bear a prominent part in contributing to the common stock of knowledge, and all who know the effect upon individual character and happiness of the habit and occupation of scientific inquiry, must regret our backwardness in this respect. The immediate cause is easily found. It is not that English workers are less inventive or industrious than their fellows across the Channel, but that their number is exceedingly small. How comes it that in a country which abounds in rich and leisurely men and women—for neither the reason of the case, nor the jealousy of the dominant sex, nor partial legislation, excludes women from sharing this pursuit with men—there are so few who seek the excitement and delights of chemical inquiry. Moralists tell us that the reason why some men are content with the pleasures of eating and drinking and the like is, that they have never had experience of the greater pleasure which the exercise of the intelligence affords. I am not about to represent it as the moral duty of those who have means and leisure to cultivate chemistry or any branch of science; but no taste for a pursuit can be developed in the absence of any knowledge of its nature. A taste for chemistry is often spoken of as a peculiar bias with which certain men are born. No doubt there are differences in natural aptitudes and tastes; but the chief reason why it is so rare for men of leisure to addict themselves to scientific pursuits is, that so few boys and young men have had experience of the pleasure which they bring. Much has been done during the last 20 years, both at the universities and at the public schools, to provide for the teaching of science. To speak of what I know best, the University of Oxford has made liberal provision for the teaching of science, and for its recognition among the studies requisite for a degree: nor have the several colleges been backward in allotting scholarships and fellowships as soon as and whenever they had reason to believe that those elected for proficiency in science would be men equal in intellectual calibre to those elected for proficiency in classics or mathematics. But the result is somewhat disappointing, and under a free-trade system science has failed to attract more than a small per centage of university students. Excellent lectures are delivered by the professors to scanty audiences, and the great bulk of those educated at the university receive no more tincture of science than their predecessors did 20 years ago.

The recognition of science among the subjects of university examinations is by no means an unmixed advantage to those concerned. Examinations have played, and will continue to play, a useful part in directing and stimulating study, and in securing the distribution of rewards according to merit; but they produce in the student, as has often been pointed out, a habit of looking to success in examination as the end of his studies. This habit of mind is peculiarly alien to the true spirit of scientific work. Only such knowledge is valued as is likely to be producible at the appointed time. Whether a theory is consistent or true is immaterial, provided it is *probable*, that is to say, advanced by some author whose authority an examiner would recognize. All incidental observations and experimental inquiry lying outside the regular laboratory course, which are the natural beginnings of original work, must be eschewed as trespassing on the time needed for preparation. The examination comes; the university career is at an end; and the student departs, perhaps with a considerable knowledge of scientific facts and theories, but without having experienced the pleasure, still so easily gained in our young science of chemistry, of adding one new fact to the pile of knowledge, and, it may be, with little more inclination to engage in such pursuit than have most of his contemporaries to continue the study of Aristotle or Livy.

However, examinations have their strong side, to which I have referred, as well as their weak side; and although it is the natural desire of a teacher to see his more promising pupils contributing to the science with whose principles and methods they have laboured to become acquainted, the younger, like the elder branches of knowledge, must be content to serve as instruments for developing men's minds. Chemistry can only claim a place in general education if its study serves, not to make men chemists, but to help in making them intelligent and well informed. If it is found to serve this purpose well, the number of chemical students at the universities ought to increase; and if the number increases, no rigour of the examination system will prevent one or two, perhaps, in every year adopting chemistry as the pursuit of their lives. But the universities have little power to determine what number of students shall follow any particular line of study. With certain reserves in favour of classics and mathematics, their system is that of free trade. Young men of 18 or 19 have tastes already formed, some for the studies which were put before them at school, in which, perhaps, they are already proficient and have been already successful, some for games and good-fellowship. It is, from the nature of the case, with the masters of schools that the responsibility rests of fixing the position of science in education. During the last ten years provision has been made at most of the larger schools for the teaching of some branches of science; and those who recall the conservatism of schoolboys, and their consequent prejudice in favour of the older studies, will understand a part of the difficulties which have had to be encountered. The main and insurmountable difficulty is what I may call the impenetrability of studies. A new subject cannot be brought in without displacing in part those to which the school hours have been allotted. It is the same difficulty which occurs again and again in human life. There are many things which it would be well to know and well to follow; but life, like school time, is too short for all. From the educational phase of this difficulty the natural difference of tastes and aptitudes provides in some degree a way of escape. I think that wherever a school can afford appliances for the teaching of chemistry, all the boys should pass through the hands of the teacher of this subject. Two or three hours a week during one school year would be sufficient to enable the teacher to judge what pupils were most promising. There may be instances to the contrary; but I do not think it likely that any boy who attended chemical lectures for a year without becoming interested in the subject would ever pursue it afterwards with success. Suppose that out of one hundred boys who have gone through this course five are selected as having shown more intelligence or interest than the rest; they should be permitted to give a considerable part of their time, while still at school, to studying science, without suffering loss of position in the school, or forfeiting the chance of scholarships or prizes. If any such system is possible and were generally adopted, each schools ending annually to the universities, or other institutions for the education of young men, its small contribution of scientific students, the professors lecture-rooms and laboratories would be filled with young men who had already learnt the rudiments of science. Laboratories of research as well as of elementary instruction would find a place at the English universities, and the reproach of barrenness would be rolled away.

Some of the defects or difficulties to which I have adverted are perhaps peculiar to our older schools and universities. The introduction of the study of natural science has borne earlier fruit in schools whose celebrity is of more recent date, such as the excellent college in this neighbourhood. Oxford and Cambridge ought to possess, but are far from possessing, such laboratories as have lately been built at the Owen's College, Manchester. It is proposed to constitute in this city a College of Science and Literature, similar to Owen's College, and in connexion with two of the Oxford colleges. The scheme set forth by its promoters appears thoroughly wise and well considered, and all who are interested in scientific education must wish it success.

I have placed first among the modes in which science, and in particular chemical science, may be advanced, the assignment to it of a more prominent and honoured place in education; but owing, as I do, my own scientific calling and opportunities of work to a bequest made to Christ Church by Dr. Matthew Lee more than 100 years ago, I cannot forget or disbelieve in the influence of endowments.

I have spoken of the leisurely class in this conntry as that to which scientific chemistry must look for its votaries. In our social conditions, and in the absence of endowments, it is hard to see where else they can be found. Men who have their livelihood to make cannot afford to spend money, and still less to bestow their time and energy, on the luxury of scientific inquiry. Even if they have the opportunity of earning their livelihood by scientific teaching, and with it the command of laboratory and apparatus, no leisure may remain to them for original work, and the impulse to such work (often, it must be admitted, of a feeble constitution) may be starved in the midst of plenty. The application of endowments to the promotion of original research is a difficult question. I am inclined to think that posts, constituted chiefly with this object, should be attached in every case to some educational body, and should have light educational duties assigned to them. The multiplication of such posts in connexion with the many colleges and schools in this country, where there is some small demand for chemical teaching, with the provision in each case of a sufficient laboratory and means of work, would probably do more than any centralized scheme for the promotion of chemical research.

To the advancement of chemistry by the formation of public opinion on the questions of scientific education and the endowment of original research, the Chemical Section of the British Association may reasonably hope to contribute. But doubts have been expressed as to the serviceableness of this or any such organization for the direct advancement of our science itself. No doubt we cannot accomplish much. Chemical inquirers at the present time may be compared to a party of children picking wild flowers in a large field; at first all were near together, but as they advanced they separated, till now they are widely scattered, singly, or in groups, each busy upon some little spot, while for every flower that is gathered 10,000 others remain untouched.

That the science of chemistry would advance more rapidly if it were possible to organize chemists into working parties, having each a definite region to explore, cannot, I think, be doubted. Is such organization in any degree possible?

The experiments of which Bacon has left a record, though curious historically, have no scientific value. But in one respect his "Physiological Remains" furnish an example which we might follow with profit. "Furthermore," he writes, "we propose *wishes* of such things as are hitherto only desired and not had, together with those things which border on them, for the exciting the industry of man's mind." I will quote further, as an example, a part of one of his "wishes," which has very recently been fulfilled. "Upon glass four things would be put in proof. The first, means to make the glass more crystalline. The second, to make it more strong for falls and for fire, though it come not to the degree to be malleable."

I do not know that the industry of M. de la Bastie's mind was excited by Bacon's mention of glass more strong for falls and for fire among things hitherto only desired and not had; but the conception of such an enumeration seems to me worthy of its author. Much fruitless and discouraging labour might be saved, a stimulus might be given to experimental inquiry, and chemical research might become more systematic and thus more productive, if Bacon's example were followed by the leaders of chemistry at the present day.

The Council of the Pharmaceutical Conference, whose meeting has just preceded our own, has published a list of subjects for research, which they commend to the attention of chemists. Where one of these subjects has been undertaken by any chemist his name is appended to it. Might not the representatives of scientific chemistry issue a similar list?

Perhaps two or three of the distinguished English chemists who are members of this association, might be willing to serve on a committee, which should put itself into communication with the leaders of chemical inquiry abroad, and should make and obtain and publish suggestions of subjects for research. Such a list so got together would, I think, find a welcome place in all scientific journals, and would thus be widely known and easily accessible to every student.

That which chiefly makes the organization of chemical inquiry desirable is the boundless extent of the field upon which we have entered. Not every fact, however laboriously attained and rigorously proved, is an important fact, in chemistry any more than in other branches of knowledge. Our aim is to discover the laws which govern the transformations of matter; and we are occupied in amassing a vast collection of receipts for the preparation of different substances, and facts as to their composition and properties, which may be of no more service to the generalizations of the science, whenever our Newton arises, than were, I conceive, the bulk of the stars to the conception of gravitation.

It may, however, be urged that the growth of chemical theory keeps pace with the accumulation of chemical facts. It is so, if the elaboration of constitutional formulæ is leading us up to such a theory. But at present, however useful and ingenious this mode of summarizing chemical facts may be, it does not amount to a theory of chemistry.

Two objections to regarding such formulæ as anything more than a chemical shorthand, as it has been termed, seem worth recalling. The first is mentioned at the outset in most text-books in which these formulæ are employed, but sometimes, I venture to think, lost sight of afterwards. The arrangement of the atoms of a molecule in one plane is equally convenient in diagrams, and improbable as a natural fact. But is not this arrangement used as though it were a natural fact, when the possible number of isomeric bodies is inferred from the number of different groupings of the atoms which can be effected on a plane surface? The conceptions of plane geometry are much simpler than those of solid geometry (which is another recommendation of the present system of formulæ); but so far as I am able to follow the similar theories which have recently been propounded independently by MM. Le Bel and Van't Hoff, the consideration

of the possible isomerisms of *solid* molecules leads to new conclusions.* Wislicenus has found that paralactic acid undergoes the same transformations as ordinary lactic acid when heated and when oxidized. The two acids differ in their action on polarized light. His conclusion is that paralactic acid does not differ in its atomic structure from the lactic acid of fermentation, and that the kind of isomerism which exists between the two acids is not connected with the difference in the reciprocal arrangement of the atoms, but rather with a difference in the geometric structure of the molecule. To this difference he gives the name of "Geometric isomerism."† The authors named above agree in supposing that the action of substances in solution on polarized light results from an unsymmetrical arrangement of atoms and radicles in three dimensions around a nucleus-atom of carbon.

The second objection relates to the statical character of the account which "developed" formulæ give of the differences between different kinds of matter. The modern theory of heat supposes, not only that the molecules which constitute any portion of matter are in constant rapid motion, but that the atoms which constitute each molecule are similarly moving to and fro. Such movement might be an oscillation about the position assigned to the several atoms in the constitutional formula of the molecule. Since, however, the modes of formation and decomposition of substances are the principal facts upon which their formulæ are based, it is to be considered whether these facts may not depend altogether upon the nature or average nature of the motion impressed upon the atoms, that is upon dynamical and not upon statical differences.

Many substances are known whose existence is contrary to the theory of valency and saturation, such as nitric oxide and carbonic oxide; others, which transgress the theory if isomerism, such as chloride of dichlordibromethane (C_2 Cl_2 Br_2, Cl_2) and bromide of tetrachlorethane (C_2 Cl_4, Br_2), which should be identical, but are isomeric: ‡ yet these theories are simply an expression of the statement that certain substances can exist or can differ, while others cannot. It is true that in the vast majority of cases the theoretical limitation seems to hold good. But just as the absence of any fossil remains of the connecting links between species is only significant if the geologic search has been sufficiently thorough, so it is with chemical theories depending upon the non-existence of certain classes of bodies. Indeed, in our case, where investigation is guided, by theory, and, as a rule, only those things which are looked for are found, the limitation may be partly of our own making. A chemist who should depart from the general course, and set himself to prepare substances whose existence is not indicated by theory, would perhaps obtain results of more than the usual interest.

Among chemical inquiries, if ever such a list as I have ventured to suggest should be drawn out, I hope that many would be included relating to the most familiar substances and the simplest cases of chemical change. The thorough study of a few reactions might perhaps bring in more knowledge of the laws of chemistry than the preparation of many new substances.

I believe that if any chemist not content with a process giving a good yield of some product examines minutely the nature of the reaction, observing its course as well as its final result, he will find much more for study than the chemical equation represents. He will probably also find that the reaction and its conditions are of a formidable complexity, and will be driven back towards the beginnings of chemistry for cases sufficiently simple for profitable study.

In concluding my remarks, I desire briefly to refer to another branch of chemical science, to the advancement of which this association seeks to contribute, I mean applied or technical chemistry. One of the principal differences between the papers read before this section, as a class, and those which the Chemical Society receives, is the larger proportion in our list of papers on technical subjects. Whatever chemists may hold, there can be no doubt that the estimation of our science by the outside world rests largely on the well-founded belief that chemistry is useful. Indeed, though scientific chemists are justly eager to vindicate the value of investigations remote from any application to the arts, they cannot but feel a livelier sense of triumph when the successful synthesis of a vegetable principle yields at the same time a product of great technical value, as in the case of the production of artificial alizarine.

By visiting in turn the principal centres of British industry, this association brings together men engaged on pure and on applied chemistry. We who come as visitors, may hope that our papers and discussions here may bring fresh interest in the science, if not actual hints for practice, to those whose art or manufacture is based on chemistry. In return, the most interesting communications the section has received have not unfrequently been the descriptions of local industries; and there is no part of our hospitable reception more welcome and more instructive to us than the opportunities which are provided of seeing chemical transformations on a large scale, effected by processes which observation and inventiveness have gradually brought to perfection, and with the surprising familiarity and skill which are engendered by daily use.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The week has not been a very eventful one in the history of the local iron trade, there having been few changes worth noting, unless the settlement of one or two of the disputes on the wages question may be regarded in that light. Messrs. John Brown and Company, Limited, Atlas Works, have arranged with their puddlers and shinglers to resume work on the understanding that if no reduction be made in South Staffordshire nothing will be deducted from their rate of payment. At the Northfield Iron-Works, Rotherham, the old rate of wages has been conceded unconditionally, but at the Parkgate establishment the men claim sixpence per ton over the Staffordshire prices, as being an old establishment custom.

Pig iron has remained firm during the period under notice, several of the Scotch special brands having become some shillings per ton dearer. Agents of the North Yorkshire houses now quote the following prices approximately for general brands:—No. 1 foundry, 58s. 6d. to 59s.; No. 2 foundry, 54s. 6d. to 55s.; No. 3 foundry, 53s. 6d. to 54s.; No. 4 foundry, 48s. 6d. to 49s.; No. 4 forge, grey, 47s. 6d. to 48s.; No. 5 forge, mottled, 47s. to 48s.; No. 6 forge white, 46s. 6d.; refined metal, 70s.; Kentledge, 57s. 6d.; and cinder pig, 40s. per ton for net cash. The whole of the leading foundry establishments are producing tolerably large lots of general castings, gas and water pipes, and some of them large lots of builders ironwork.

The brassfounders are quite as busy as when last referred to, on all kinds of steam, gas, and water fittings.

In the coal trade there is an upward movement so far as household qualities are concered, and there is also some little improvement in gas and steam qualities. Gas coal is quoted at 8s. 6d. to 10s. 6d. per ton, several new contracts having been placed, and others renewed at figures ranging between those limits. Steam is not in very strong demand, but is steady in price.

IRON AND COAL TRADES OF SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE.

(FROM OUR OWN CORRESPONDENT.)

Rather more animation has prevailed in the local iron trade during the past week than has been observable lately; but the business actually transacted has not been of important extent. Buyers still appear to operate with great caution, notwithstanding the decidedly firmer tone of the market, which is more especially noticeable in respect of the medium qualities of finished iron. This improvement is, no doubt, due not so much to any steady increase in the demand, as to the present unsettled aspect of the coal and labour markets. It is an undisputed fact that skilled labour in the iron trade is now very scarce, and it is, therefore, not improbable that the old rate of wages will have to be resumed. In view of this, ironmasters are in many cases obtaining a slight advance upon recent quotations. Bars of the commonest quality may still be had at £7 15s. per ton, but the supply is limited; and the more general quotation for unmarked bars is now £8 per ton. Marked bars are nominally unchanged at £10 to £10 12s. 6d. Sheets continue in leading request, and the demand for galvanized roofing qualities is well sustained. Angles, tube, strip, rods, bars, and hoops, for local consumption, are in improving inquiry.

The engineering and ironfoundry establishments throughout the district are in very active operation; this season's demand for gas and water mains has been unusually heavy, and in many cases the contracts of some standing are still uncompleted.

At Wednesbury the wrought tube and fitting makers report a steadily increasing business, and there is now every reason to expect for these industries a gradual return to something like their former prosperity.

In pig iron, transactions are still slow, but prices for the better qualities are firm. Hot blast native all-mine is quoted £4 10s. to £4 15s., and cold blast £6 per ton; common cinder pig is on offer at £2 10s. Production is still restricted, and there is little prospect of any addition being made to the number of furnaces in blast.

In the coal trade there is only a moderate business doing; rumours have been rather freely circulated during the past week touching a probable advance in prices, though at present there is little prospect of the adoption of such a measure. Prices, especially as regards the medium and common qualities, are still very weak, and contracts may be readily arranged on terms favourable to the buyer.

THE COAL AND IRON TRADES OF LANCASHIRE.

(FROM OUR OWN CORRESPONDENT.)

There is very little material change to notice in the market for coal in this district since my last report. The demand for house coal is tolerably good for the time of the year, but the weather is still too mild to affect very sensibly the consumption, and winter stocks are not yet being taken in to any very large extent. Prices for this class of coal continue firm, and no reduction is now looked forward to. In other classes of fuel, however, the market is not so firm, and there is a good deal of underselling with inferior sorts of furnace and engine fuel, and stocks in the Manchester district are accumulating. There is some expectation that a reduction in the price of the latter qualities of coal will be necessary, and, although the principal firms still maintain their list rates, it is not improbable that concessions of some sort will have to be made next month, in order to meet the competition which at present keeps high-priced fuels, except the above class, out of the market.

The state of trade in the various coal-producing districts of Lancashire is without much change, and prices are about stationary, although there is a want of firmness in common coals, which only meet with a moderate inquiry. The average pit prices in the Wigan district are about as under:—Arley Mine coal, 12s. to 13s. 6d. per ton; Pemberton four-feet, 10s. 6d. to 11s.; Wigan four-feet, suitable for gas purposes, 10s. 6d.; ordinary ditto, 9s. 6d.; Wigan five-feet, 8s. to 9s.; bargy, 6s. to 7s.; and good slack, 4s. to 5s. per ton.

Notwithstanding that there has been a little more doing in exports, the shipping trade generally continues dull, and a good deal of the Lancashire coasting trade is being taken away by the South Wales colliery proprietors, who are quoting lower rates than are ruling here.

In the iron trade, the market, so far as this district is concerned, is at a complete standstill, and there are no inquiries of any importance stirring. As the high prices now quoted for foundry pig iron are only considered to be temporary, consumers are still holding back their orders, and merchants, in some cases, are already operating for a fall. No. 3 Middlesbrough foundry, for immediate delivery in this district, is quoted at 63s. 9d. per ton; No. 4, 58s. 9d.; and No. 4 forge, 56s. 9d. per ton; but for delivery over the year, a reduction of 2s. per ton on foundry, and 1s. per ton on forge is accepted. In manufactured iron there is very little change, except that for good specifications prices are a trifle easier.

Founders are only very poorly supplied with orders, and forge proprietors are scarcely in any better position; whilst the Lancashire blast-furnace proprietors are receiving little or no new business.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The price of all kinds of second-class coals had a decidedly downward tendency last week. Second-class steam was from 11s. to 12s. per ton, but the highest price realized for best qualities was 14s. per ton, and household and gas coals barely maintained recent quotations. Stormy weather came on on Friday, and everything had a winter-like appearance, which will probably harden the household and gas coal trades; but it is not at all probable, from the abundance of coals that there is in the market, there will be much advance upon them in price. It may be stated that nearly all the small second-class pits are doing very badly. Scarcely any of them are paying just now, and it is generally expected that coals, instead of getting higher, will be lower. Manufacturing and small coals continue to be very much of a drug. The collieries are keen of business at almost any price for small coals. The winter prospects are not at all good, as there is no appearance of any revival in the trade. A good few collieries continue to work short time, and some of the smaller pits have about closed altogether. The price of coke is low.

There continues to be an excellent supply of handy little sailing ships from the channel and east coast in the coal ports. As might be anticipated, they are in request. Those that are taken up have quick loading turns, and coasting freights for small ships have kept firm. The supply of steam tonnage is a great deal more than the trade requires, and all sorts of freights for steamers in the coal trade are low, and are likely to continue so. There can be no question but that business in the coal trade for 1875 will be in favour of the shippers, and that a low rate of freight will continue until the end of the year at least.

In the Cleveland iron district business was more active last week, as merchants were buying up all available pig iron for shipment, so as to complete their continental deliveries before the close of the navigation season. Some sorts of pig iron were scarce. There is no great inquiry for pig iron for home consumption. The finished iron trade continues in a very depressed state. A good few men have been paid off from the engine factories on the Tyne, and some large concerns on that river have put their men upon three-quarter time. The prospects of the iron shipbuilding trade for the winter are extremely unsatisfactory.

The demand for chemicals fell off last week, and prices were lower, with some difficulty in making sales. There is less demand for fire-clay bricks, except the best makes. The prices of second class sorts are lower, and the shipments have not been so large. The building trade of the North of England keeps very brisk. It is the only business where the demand for labour is in excess of the supply. Masons, joiners, and plasterers are wanted, and high wages are paid.

* Bull. de la Soc. Chim. de Paris, t. xxii., p. 337; and t. xxiii., p. 295.
† Ann. de Chim. et de Phys., 5e série, t. i., p. 122.
‡ Bull. de la Soc. Chim. de Paris, t. xxiv., p. 114.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The annual meeting of the Whitburn Gaslight Company was held last Friday, when it was agreed that a dividend of 5 per cent. be paid to the shareholders, and that the price of gas be reduced 10d. per 1000 cubic feet, thus bringing the price down to 6s. 8d. per 1000 feet. The directors and other office-bearers of the company were re-elected.

At a special meeting of the Town Council of Dumbarton held last Wednesday evening, Provost Bennett reviewed the financial position of the burgh, and, among other things, he spoke of the corporation gas question. He said that the manufacture and supply of gas, as was to be expected, did not turn out very favourably during their first year's management of the works, the balance against the corporation at Aug. 1, 1874, being no less a sum than £588; but, as in other affairs, the tide had turned, and at the end of the second financial year the accounts showed that, not only had that deficiency been met, but that there was a clear balance of £304 in favour of the corporation, being a total improvement for the year of the handsome sum of £887, and that, too, after paying the shareholders of the old company their guaranteed 9 per cent., and expending nearly £3000 on the extension and improvement of the gas-works. The Provost further mentioned, amid applause, that such a gratifying state of matters would, he trusted, put it in the power of the Town Council to intimate a reduction in the price of gas, at the November quarter, of 6d., or even 1s., per 1000 cubic feet.

A pecuniary difficulty of long standing, in connexion with the erection of the new gas-works for the Greenock Corporation, was settled last Monday, at a private meeting of the Police Board of that town. Mr. York, the contractor who erected the works, had lodged a claim for extras amounting to £11,000; but the claim was compromised by the Police Board agreeing to pay him £4500, which was accepted.

Captain Clark, of Campbellfield, Irvine, lately received a document in the form of a certificate, signed by the Government inspector of gas-meters, Glasgow, testifying that meter No. 338,777, sent in by him, registered 4·2 per cent. in favour of seller, the meter being, therefore, 2·2 per cent. faster than is allowed by the Sales of Gas Act. This particular fact is regarded with much interest by gas consumers in the West of Scotland.

The Sanitary Committee of the local authority of Campsie, an important industrial parish about a dozen miles to the north of Glasgow, have firmly resolved on improving the water supply of Lennoxtown and the parish generally. They lately paid a visit to the proposed source of the new supply on the Ferits Hill, for the purpose of making a minute examination of the springs, and fixing the most convenient and proper route for the piping from the source into Lennoxtown. Mr. Smith, of Messrs. Storry and Smith, civil engineers, Glasgow, accompanied the committee, and was instructed to make a proper survey, and submit a fresh statement of the probable cost with as little delay as possible, so that the work may be put into the hands of the contractors at an early date.

The town of Jedburgh is becoming very much concerned about its sanitary welfare. There is a great scarcity of water in the town, and application has been made to the Marquis of Lothian for a special privilege, by way of eking out the supply. A difficulty has besides been raised by that nobleman with reference to the discharge of the sewage of the town into the river Jed. This matter has been taken into consideration by the Sewage Committee of the Police Commission.

It would almost seem as if the ratepayers of Forfar were determined to refuse to have any additional water supply. The town continues to be quite in a ferment on the subject, but the Board of Supervision have given the local authority distinctly to understand that it is not their duty to take a vote of the inhabitants on the question of a water supply, that the local authority are entrusted by the Legislature with the administration of the Act, and that it is their statutory duty to provide the requisite supply of wholesome water for the inhabitants. Some of the civic authorities are encouraging the people to resist the attempt to bring an additional water supply into the town.

It may be of some interest to local authorities and ratepayers in other parts of the country to know what rates are charged for water in Aberdeen, where the supply is both excellent in quality and abundant in quantity. On occupiers the following rates have just been fixed:—5d. per £1 on dwelling-houses; 2½d. per £1 on other premises; also for private water-rent, 5d. per £1 on dwelling-houses, and 2½d. or 5d. per £1, according as small or large supply is used, in other premises. On owners:—Private water-rent, 5d. per £1 on dwelling-houses, and 2½d. or 5d. per £1, according as small or large supply is used, in other premises. Beyond police boundary:—1s. 3½d. per £1 from low service, and 1s. 5d. per £1 from high service, besides interest on pipes where chargeable.

The Edinburgh rates have been fixed as follows:—Domestic rate, 6d. per £1 on householders, and 1½d. per £1 on shops, with a public rate of ½d. per £1, payable in equal proportions by owners and occupiers. The estimated income for the year 1875-76 is £47,866 19s. 4d., as against an estimated expenditure of £45,814 19s. 3d., and an actual expenditure of £45,725 1s. 2¾d. for the year 1874-75. It is expected that application will have to be made to Parliament, in the ensuing session, for power to alter and amend the Trustees Act of 1874, and to make a reservoir at Rosebery, a step which seems to be rendered necessary by the discovery of the insufficient character of the site selected for the Edgelaw Embankment.

A good deal of business was done during the past week in the Glasgow pig iron market, and prices were generally pretty firm. The closing quotation on Friday was 67s. buyers, and 67s. 1½d. sellers.

It is feared that some complication may arise in the coal trade, owing to a demand for an advance of wages being made by the miners in several districts. There is certainly no very material change in the demand for coal.

WHITLEY PARTNERS, LIMITED.—A petition to wind up this company has been presented to the Court of Chancery by the banking firm of William Williams Brown and Co., of Leeds, as creditors of the company. The petition is set down for hearing before Vice-Chancellor Sir James Bacon, on the 5th prox.

BARKING PUBLIC LIGHTING.—Moonshine will be thrown into the shade at Barking by the well-regulated combustion of mineral oil, at a saving of about 62½ per cent. on the cost of gas. But why not save the whole 100 per cent., most sapient men of Barking? Why not rely on the unaided luminosity of your own brilliant talents and enlightened consciences?—*Figaro.*

CONTAMINATION OF WATER BY COPPER PIPES.—Reichardt points out that most waters take up more or less metal from iron and lead pipes, and that copper is not in any way a better material. Water which, when freshly laid on in 1859 through copper pipes, contained 7·2 parts of copper in a million contained 0·8 of copper per million in 1872. Even this latter water gave a perceptible green metallic soap. Although the quantity has diminished during the 13 years, yet at the end of that time a most objectionable amount of copper was still taken.

SUDDEN DEATH AT THE NOTTINGHAM GAS-WORKS.—An inquest was held on Monday the 20th inst., at Nottingham, upon the body of a young man named William Beck, a labourer at the gas-works. From the evidence it appeared that about four o'clock in the afternoon of the previous day, he had just taken a barrow of coke, and was in the act of moving a screen which lay in the way, when he staggered, and before any assistance could be rendered, fell. Up to the time he fell he appeared to be quite well, and never complained of being ill. There was no one near him at the time, the stokers being about 100 yards away. Dr. Cooper, of Sneinton, was sent for, but deceased was quite dead when he arrived. A foreman at the gas-works stated that he had never heard deceased complain of ill health, and did not notice any difference in his appearance. The wheeling of coke did not require great exertion. Elizabeth Beck, widow of deceased, said that when he left home on the day in question he was in good health. A verdict of "Death from natural causes" was returned.

THE SEWAGE OF BARNSLEY.—At a special meeting of the Barnsley Town Council on Tuesday last, the principal business was that relating to the disposal of the town sewage, which at the present time is poured into the river Dearne. Mr. Bailey Denton, with whom the council have been in correspondence for some time, and who had recommended intermittent downward filtration as a mode of dealing with the matter, was present and explained the system. In the course of a lengthy discussion the general opinion was in favour of intermittent downward filtration with broad irrigation. A good deal of conversation ensued as to the choice of land, two plots, one at Hoyle Mill and the other at Burton Grange. Mr. Bailey Denton expressed his opinion that the last-named plot would be the best, but if the council decided to carry out the works on the Hoyle Mill land he would do it, and do it well. It was ultimately agreed that a committee should be appointed to wait on Colonel Wombwell, the owner of the land, with a view of ascertaining at what price he would sell 60 acres to the corporation.

HULL WATER SUPPLY.—At the meeting of the Water-Works Committee on the 20th inst., the engineer, Mr. D. Maxwell, reported that the total quantity of water supplied during the fortnight was 67,147,517 gallons; average daily supply, 4,796,251 gallons. Coal consumed, 95 tons 5 cwt.; ditto, per million gallons, 28·9 cwt.; cost, 17s. 6d. Of the above 67 millions supplied to the town during the fortnight, about 7 millions, or about half a million per day, had passed through the reservoir, being pumped therefrom in the middle of the working days, and repaid during the nights, percolating in each case through the sand in the bottom, so as to keep the water as free as possible from vegetable matter. As a rule none of the water pumped into the town from 5 p.m to 8 o'clock next morning, and none of the Sunday's pumping had ever been in the reservoirs at all, and consequently was not exposed to the light until it flowed from the consumers taps. The reservoirs were open to public inspection, and he believed their condition would compare most favourably with that of previous summers. The coal per million gallons was more than usual, but being a low-priced unscreened coal the cost per million gallons was less than it had been since the rise in the price of coal five years ago.

PROPOSED PURCHASE OF THE EXETER GAS-WORKS BY THE CORPORATION.—At a meeting of the Exeter Town Council on Wednesday last, a resolution passed by the Sanitary Committee, to the effect that it was desirable that the undertaking of the Exeter Gaslight and Coke Company should be in the hands of the council, and that the company be applied to to know if they were willing to treat with the council for a transfer of their works, and on what terms, was adopted. The mayor said the council by confirming the report of the committee had affirmed the principle that the city should become the possessor of the gas-works of the place. He thought that was the best thing they could do. He hoped they would push the matter until they had the works in their own hands. If there was any difficulty about the acquisition of the gas-works by friendly means, other means must be employed, and he for one would not hesitate at the expense. If the company would not listen to reasonable arrangements, the corporation must resort to compulsion. He might as well say at once that the matter now rested with the citizens. The authorities required to be supported by the unanimous voice of the people in carrying this out. He trusted that after so many years annoyance this support would not be wanting.

REDUCTIONS IN THE PRICE OF GAS.—It was announced in the report of the Bristol United Gas Company, laid before the meeting of shareholders on the 16th inst., that the directors had reduced the price of gas since the 1st of July from 4s. to 3s. 6d. The directors of the Rhosllanerchrugog Gas Company have reduced the price of gas to 5s. 10d. per 1000 feet, subject to a discount of 5d. per 1000 feet, if accounts are paid on or before the 5th of the month following the quarter day. At Loughborough the price has been reduced to 3s. 8d., and at Liskeard, at the annual meeting of the company, held on Tuesday, the 17th inst., a further reduction of 10d. per 1000, reducing it to 5s. per 1000, was recommended by the directors, and unanimously agreed to by the meeting, the reduced rate to be charged from the 30th of June last. Notice has been given to the consumers of the Crystal Palace District Company's gas, of a reduction of price to 4s. 1d., from the Michaelmas quarter. The directors of the Alliance and Dublin Company promise a reduction of 4d. at Christmas next, and the report of the Chartered Company, to be presented at their meeting on Friday, states that the directors anticipate their ability to earn during the coming year their full dividend at the present reduced price of gas.

THE CORPORATION OF BIRMINGHAM AND THE GAS COMPANIES. — It will be remembered that the Act of Parliament authorizing the purchase of the gas-works by the Corporation of Birmingham, provided that the works of the Birmingham Company should be transferred within two months from the passing of the Act, and that the works of the Staffordshire Company should be transferred either on the 1st of July, or on the 1st of January. The Act, however, did not receive the Royal Assent until after the former date, and therefore the company had the power of carrying on their business until January next. As the works of the Birmingham Company were transferred to the Corporation on the 1st of September, and as it was manifestly desirable that both undertakings should pass at once under the same management, negotiations were opened by the mayor, on behalf of the Gas Committee, for the immediate possession of the Staffordshire Company's works. We learn, with satisfaction, that these negotiations have proved successful, and that an arrangement has been made by which the transfer to the corporation dates from the 1st of July last, as was originally contemplated. The basis of the arrangement is a division of the net profits accruing during the current half year, when these are ascertained. The agreement is, of course, subject to the approval of the shareholders of the company, who meet on the 28th inst.—*Daily Post.*

CHURCH STRETTON PUBLIC LIGHTING.—The annual meeting of ratepayers under the 3rd & 4th William IV., chap. 90, was held on the 14th inst. The chair was taken by Mr. Andrews. The lighting inspectors reported that last year they contracted with the proprietor of the gas-works for lighting the public streets; and a new lamp was fixed in the Station Road and lighted with the others at a cost of £25. In the commencement of the lighting season the inspectors had occasion to complain of the insufficient supply of gas, and the town was afterwards lighted in a perfectly satisfactory manner. Having a balance in hand of £7 16s. 10d., the inspectors at the last meeting of ratepayers asked for a vote of £25 only towards the expenditure of the then current year. After paying the amount of the contract for gas (£25), and other items of expenditure, that balance has been considerably reduced, although there still remained to the credit of the inspectors a sum of £3 2s. 4d. This would not be sufficient to carry through another season without the present meeting voting a larger sum. The rate levied last year at 4½d. in the pound realized the gross sum of £24 10s. 3d.; but after deducting voids and paupers and the cost of signing the rate, the net sum which came into the treasurer's hands was £24 5s. 2d. The inspectors would require, and now asked for, a larger sum, say £30, for the working expenses of the current year, out of which there would probably be a small balance to carry forward to the next year's account. After some discussion the amount asked for was voted. The inspectors have since contracted with Mr. W. Hyslop, the proprietor of the gas-works, for the supply of gas to the public lamps from the 21st inst. to the 21st of April next inclusive for the sum of £25, upon the usual conditions and reservations.

SWANSEA NEW WATER-WORKS.—These works, which are being carried out by the well-known contractors, Messrs. Geen and Dickon, of Birmingham and Swansea, at Velindre, are progressing satisfactorily. They are of a stupendous character, and some 200 men are busy in shaft-sinking, rock-boring, tunnelling, masonry, and labouring, while the hissing and puffing of the various steam-engines afford proof of the energy which characterizes the whole undertaking. The works are intended to supplement the Lliw, and when complete will afford an additional water supply of about two-thirds of the present supply. The outlet has been connected with the present distributive mains, about a mile distant, and will afford an additional daily supply of a million gallons. The whole of the plans and sections of the new works were designed and prepared by the borough surveyor, Mr. Edward Cousins, and they have been pronounced by the most eminent and experienced engineers as admirable, and exactly suited for the works. The contract price is £45,000. Profiting by the experience gained in the construction of the Lliw embankment and works, the Blaenant Ddu will be carried out upon a different principle, and one which will render it almost impossible that any subsidence shall ever occur in the embankments. The alteration in the proposed work has, however, necessitated the driving of an extensive tunnel through a solid rock some 200 yards in length, entering the mountain next the reservoir, and terminating outside the bank. This tunnel is intercepted by a large well about 90 feet deep, which is for the purpose of being fitted up with the valves for governing the supply of water. This system permits of the bank being made complete and perfect without any pipes running through it, the pipes in the great majority of cases being the cause of subsidence and leakage. It will thus be seen that the water will enter the tunnel inside the reservoir, will be governed by the valves, and run through outside the bank. The bank, both inside and outside, has been carefully put together with fine selected materials, and the puddle trench has been excavated for the whole length down into the solid rock, extending in some places to a depth of between 70 and 80 feet. This work was, of course, one of a most difficult and dangerous nature, requiring the greatest skill and care. The timbering which is used in shoring up and propping is something incredible; and we are glad to hear that in consequence of the extreme care which has been taken no accident of any moment has occurred. The whole of the iron pipes of 2 feet diameter have been laid over the outside of the bank, and the connexion made with the old conduit at a distance of nearly a mile, and thus the water has been utilized for the past two months, and sent into Swansea. The excavation of the by-wash, which is of considerable extent, is about two-thirds completed, and the masonry has just been commenced. The contract time for the completion of the whole works extends over about 18 months more; and should no untoward event happen, there can be little doubt that the works will be finished within the specified time.—*Swansea Herald.*

SERIOUS CHARGE AGAINST THE SUPERINTENDENT OF THE BOLTON (CORPORATION) WATER-WORKS.—A special meeting of the Bolton Town Council was held on Wednesday last to decide upon the course to be pursued in reference to Mr. John Wrigley, superintendent of the water-works department, who for nearly a quarter of a century has been in the employ of the corporation. In consequence of certain irregularities which had been discovered in one or two of the corporate departments, Mr. Halliday, accountant of Manchester, was some time ago instructed to audit the accounts of the borough treasurer. In the course of his investigation it become necessary that he should have the books of the water-works department. An application was accordingly made to Mr. Wrigley for his books, but as he was then at home ill he declined to give them up or allow them to be examined, except in his presence. The Water-Works Committee immediately suspended him from office, and then appointed a committee to institute a search in Mr. Wrigley's office. This led to one or two remarkable discoveries. In the floor of the office of Mr. Wrigley there had been constructed a trap-door, for the purpose of giving access to a chamber beneath, and of affording facilities for the repair of any pipes that might become defective. The carpet over this trap-door was found to be cut, apparently to enable the door itself to be opened, and on a descent being made into the chamber two of the books were found. Seventeen other books, however, were still discovered to be missing. Under these circumstances, the committee instructed Mr. Halliday with such documents as he had, to investigate the accounts of the water-works department, with a view to ascertain what were the receipts and payments. Defalcations to the extent of nearly £5000 during the last five years were then discovered. A warrant was obtained for Mr. Wrigley's apprehension, but in consequence of the state of his health, it was not executed until after the meeting of the Town Council on Wednesday. In the meantime, however, his house had been surrounded by detectives to prevent his escape. The chairman of the Water-Works Committee (Alderman Rushton) at the meeting of the council moved a resolution requiring Mr. Wrigley to make out and deliver to the town-clerk, within five days from the date of service of notice, a statement, made out in a debtor and creditor form, of all moneys received by him, and showing for what purpose such moneys had been disposed of; also requiring him to deliver all vouchers and receipts for payments made by him, and pay over to the borough treasurer all moneys owing by him on balance of account. This resolution having been carried, Mr. Rushton further moved that the town-clerk be authorized to take all requisite proceedings against Mr. Wrigley on his failing to comply with the resolution previously passed. He said this step was necessary because the committee had been met by Mr. Wrigley with a species of defiance and determination to foil and resist every proceeding which the committee might think necessary to take. This resolution was also passed, and the chief constable (Mr. T. Beech) at once proceeded to the house of Mr. Wrigley, and took him into custody. The warrant charged him with the embezzlement of £475 between April 16, 1874, and July 16, 1874. Prisoner was brought before the borough magistrates on Thursday, and after examination was remanded for a week, bail being accepted, himself in £4000, and two securities in £2000 each.

Register of New Patents.

3997.—ROBINSON, J., West Bromwich, "*Improvements in apparatus for charging gas-retorts.*" Patent dated Nov. 21, 1874.

This invention relates to a peculiar construction and arrangement of scoop for charging gas-retorts, suitable for use in combination with what are known as mechanical or steam stokers, and has for its object the affording of greater facility of charging gas-retorts more especially in those cases where cannel and other large coal are used.

The scoop consists of two segments of a cylinder of any convenient radius or depth, according to the transverse area of the retorts employed. The outer edges of these two segments may, if desired, be considerably above the centre line of the shaft or spindle upon which they are mounted, and may form, in fact, about two-thirds of a cylinder with a mouth or long opening on the upper side, of about one-third of the circumference of the cylinder, to allow of the coals falling readily into the scoop when being filled, whilst at the same time preventing any coals from falling over the sides of the scoop when entering the retort.

The two segments are mounted on two separate heads or bosses; the larger or outer segment, which folds completely over and encloses the smaller one when the scoop has discharged its contents and is being withdrawn, being made fast on to a hollow or tubular spindle, whilst the smaller segment is mounted on a head or boss which is keyed or otherwise secured to the end of a solid shaft or spindle which turns inside the outer or tubular spindle.

With a view to the opening and closing of these two segments, various mechanical arrangements may be adopted, but the following has been found to answer well in practice:—Upon the tubular and solid shafts or spindles there are mounted two bevel wheels or pinions, one on each, both gearing into a third bevel wheel having a spur wheel cast upon it back. This spur wheel engages into the teeth of a horizontal reciprocating rack, deriving therefrom a rotary motion, which it transmits through the bevel gearing to the spindles, and causes the segments to turn in opposite directions, thereby opening the bottom of the scoop and discharging the contents into the retort. The larger segment folds over the smaller one, and both are thus brought vertically over the centre of the spindles, leaving a larger free space for the coals or charge than is afforded by the ordinary mechanical scoops, and obviating the inconvenience of some of the coals being dragged out of the retort by the scoop during its withdrawal. The segments are locked in their proper relative positions whilst entering and being withdrawn from the retort by a notched disc on the solid spindle, into the notches of which engage catches or detents.

The closing edges of the segments may either be parallel to the axis of the spindles or disposed obliquely thereto, and the segments may be actuated either by the forward and backward motion of the scoop carriage, by springs, or hydraulic, steam, or other power.

4021.—SCHÜSSLER, C. F., Hamburg, "*Improvements in the manufacture of air gas for lighting and heating purposes, and in the apparatus connected therewith.*" Provisional protection only obtained. Dated Nov. 23, 1874.

These improvements may be described in the following manner:—Within a chamber, box, or receptacle a series of channels or tubes is arranged so that they communicate with an entrance pipe on one side of the chamber, and with an outlet or exit-pipe on the other side or top. This chamber is closed in and provided with a screw-plug through which the spirit is fed to supply the channels or tubes of the interior, the quantity of spirit so fed being regulated by a float and rack actuating an index on the exterior of the chamber. The entrance-pipe of the chamber communicates direct with a bellows provided with a reserve chamber and valve, which is loaded so that the escape of air from the reserve can be regulated at any pressure desired. The action of the bellows is obtained through the medium of a crank-shaft worked by a spring or weight, and a train of wheels similar to those of a clock. When sufficient spirit has been supplied, the screw plug is replaced and the bellows giving the feed of air are set in motion.

The air as it is supplied to the chamber containing the hydrocarbon is directed to pass along channels or tubes, during which and before it escapes therefrom at the outlet becomes thoroughly saturated and transformed into an illuminating gas which may at once be conveyed direct to the burners or stored for subsequent use.

In order that the evaporation of the spirit in the hydrocarbon chamber shall not be reduced, to a temperature producing condensation during the process of manufacture, a syphon pipe in connexion with a vessel outside is arranged to enter the interior of the chamber; this syphon is supplied with water from the vessel which is heated by a lamp, thus causing a circulation through the syphon pipe of hot water, which maintains the spirit during its absorption by the air at a uniform heat of about 60° Fahr.

The channels containing the spirit within the interior of the chamber are constructed so that the spirit they contain is taken up by the supply of air uniformly until the whole is absorbed, thereby allowing no depreciation in the heating or illuminating qualities of the gas produced.

4027.—HARROLD, W., West Bromwich, "*Improvements in gas-stoves.*" Patent dated Nov. 24, 1874.

According to this invention, when the stove is in operation the impure air evolved by the combustion of the gas passes away through the flue or waste-pipe provided, and the vertical tubes becoming heated, the outer or atmospheric air circulates through them without coming into contact with the gas flame, and the air contained between the two casings with which the stove is provided also becomes heated, and the heated air thus created, being of pure quality, is allowed to escape and mix with the outer air of the room in which the gas-stove is in operation, by means of small openings provided at the top of the outer casing.

4036.—BROOKS, F. W., New York, "*Improvements in meters for measuring water and other liquids.*" Dated Nov. 24, 1874. Void by reason of the patentee having neglected to file a specification in pursuance of the conditions of the letters patent.

This invention relates to an improvement in the dials of meters for measuring water and other liquids, whereby any discoloration produced by the contact of the water with the counter gearing, or with other parts of the meter, is prevented from obscuring the index or dial. For this purpose, instead of marking the index or dial on a plate forming, or fixed to, the upper plate of the counting apparatus, it is formed on a glass disc, on the top or bottom surface of which the dial or index is cut or otherwise indicated; or two glass discs may be employed, in which case the dial or index is cut on the upper side of the lower disc, or on the under side of the upper disc, the two discs being placed preferably in close contact with each other. The hands or pointers are to be placed as near as possible to the glass disc or dics without touching them. By these means the water or other liquid may be allowed free access to the counting apparatus and dial, and thereby obviate the necessity heretofore existing in some cases of passing the first motion spindle through a stuffing-box.

4043.—RITCHIE, C., Brixton, Surrey, "*Improvements in apparatus for utilising heat for heating, cooking, ventilating, and lighting.*" Provisional protection only obtained. Dated Nov. 24, 1874.

The specification of this patent refers throughout to a former patented arrangement of the same inventor, and cannot be described apart from it.

4045.—WESTLEY, J., Salford, "*Improvements in the construction of taps and valves.*" Provisional protection only obtained. Dated Nov. 25, 1874.

This invention relates to the construction of all taps or valves employed for steam, water, or other purposes wherein a valve or clack fits on to or into a seating, and consists principally in providing the taps or valves with loose seatings, the object being to afford facility for the repair or renewal of such seatings when required without the necessity for a new tap or valve altogether, and thus to effect a considerable economy or saving of expense.

4158.—GOODALL, R., Armley, near Leeds, "*Improved means or method of clarifying impure water or sewage, and preparing the precipitate or sludge for re-use.*" Patent dated Dec. 3, 1874.

These improved means consist in taking common ashes, gas lime, or waste lime, and adding thereto sulphuric acid or brown oil of vitriol; water is then added in sufficient quantity to make the mass flow along pipes. When the impure waters contain soapy or unctuous matter, slaked lime is used first, or the following mortar—say six parts of slaked lime and one part of animal carbon ground together with water, and agitated; a portion of the acid mixture is then added as above, and the whole agitated together. To prepare the sludge for re-use it is lifted on to strainers and allowed to remain for a time to thicken, and then about the proportion of one-third sludge is mixed with two-thirds newly slaked lime, and the mixture being ground may then be used to clarify.

4162.—CLARK, A. M., Chancery Lane, London, "*Improvements in the musical instrument known as the pyrophone.*" A communication. Patent dated Dec. 3, 1874.

This invention relates to improvements on a former patent relating to the above instrument, and consists in obtaining in the same tube in which the

sound is produced, not only its fundamental tone, but also the sharp tones, semi-tones, and intermediate tones. The apparatus was described in the JOURNAL, vol. XXV., p. 261.

4164.—DAVISON, J., South Shields, "*Improvements in apparatus for removing dead centres in crank-shafts, especially applicable to hand-pumps.*" Provisional protection only obtained. Dated Dec. 4, 1874.

This invention relates to the removal of dead centres in crank shafts, and is effected by keying on to a straight longitudinal shaft supported in journals, a hollow barrel with solid ends, dividend diagonally and spirally into two portions, and so set apart from each other as to permit a pin to travel to and fro on the shaft, and between and along the divided edges of the two portions. Connected to the external end of the pin is an upright arm fixed to the cross-head that works on a centre below the barrel. When the pin is driven to and fro along the shaft by the revolution of the barrel, the pin carries with it the upright arm of the cross-head, causing the same to oscillate, and by that means giving motion to the pump-rods attached to the two horizontal arms of the cross-head.

4200.—JOHNSON, J. H., Lincoln's Inn Fields, London, "*Improvements in carburettors.*" A communication. Provisional protection only obtained. Dated Dec. 7, 1874.

This invention relates to apparatus for carburetting air and gas, and has for its object the ensuring a thorough admixture of the air or gas with the hydrocarbon vapour.

In order to effect this object it is proposed to arrange the apparatus in the following manner:—An outer casing is provided, to the bottom of which there is secured an internal cylinder which is perforated at points adjacent to its upper and lower ends with a number of holes. From the upper end of the cylinder projects downward and outward an inclined hood or deflector. The gasoline or other liquid hydrocarbon is supplied by a pipe communicating with the bottom of the cylinder, and the gas or air to be carburetted is also admitted through a pipe which extends upward into the cylinder, and is capped by a governor or regulator consisting of a cylinder perforated with holes at or near the top. The regulator is free to rise and fall within the fixed cylinder, and may be either open at the bottom, and entirely independent of the gas or air pipe, or be fitted round, and arranged to be guided in its movements by the pipe; but it should be of such height that it may be lowered to its full extent without closing the mouth of the pipe.

The space between the casing and the fixed cylinder, including the space between it and the hood or deflector, is filled with sawdust, which readily absorbs and becomes completely saturated with the liquid hydrocarbon admitted, the liquid escaping through the lower perforations of the cylinder into the outer casing, which is furnished with a gauge cock or cocks, and with an indicator by which the height of the liquid within the apparatus may be determined.

The gas or air to be carburetted enters the governor or regulator (which rises and falls in accordance with the pressure), and escapes through the perforations, rises to the top of the cylinder, and escapes thence through its perforations into the sawdust-packed space within the hood or deflector. By means of this the air or gas is spread, and compelled to pass downward and outward through the mass of saturated sawdust, and finally rise through the latter before it can reach the outlet-pipe, so that a thorough admixture of the air or gas with the hydrocarbon vapour given off by the saturated sawdust is effected.

The regulator or governor with its perforations prevents pulsations or flickering of the gas at the burners, owing to sudden variations in the pressure of the air or gas supplied to the apparatus, such variations in pressure being compensated for, and equilibrium maintained by the rising and falling of the regulator or governor.

APPLICATIONS FOR LETTERS PATENT.

3247.—FLEURY, F. G., Bristol, "Improvements in water-meters or apparatus for measuring the flow of liquids or fluids." Sept. 17, 1875.

3250.—EWER, E. DE, and BLOOMFIELD, H., Maidenhead, Berks, "Improvements in the means or apparatus employed for generating and supplying lighting gas produced from hydrocarbon oils." Sept. 17, 1875.

3253.—INGHAM, W. P., and HILL, A. C., York, "Improvements in machinery for making clay retorts and other similar articles from clay." Sept. 17, 1875.

3254.—MORGAN-BROWN, W., Southampton Buildings, London, "Improvements in the manufacture of ammoniacal salts." A communication. Sept. 17, 1875.

3256.—M'DOUGALL, I. S., Manchester, "Improvements in furnaces or fire-places and in apparatus connected therewith." Sept. 17, 1875.

3258.—JUDKINS, C., Fleet Street, London, "Improvements in apparatus for regulating the supply of gas to gas-burners." Sept. 17, 1875.

3260.—SOLEY, G. T., Liverpool, "An improved self-sealing cover or lid for gas and other retorts, manholes, ships side-lights, fire extincteurs, vaults, sugar filters, and vessels for containing gases, chemicals, fruits, and other liquids and substances." A communication. Sept. 17, 1875.

3267.—TURNER, S., the younger, J., and R., Rochdale, "Improved means for securing the joints of steam and water pipes, and for other similar purposes." Sept. 18, 1875.

3269.—FIELD, E., Adelphi, London, "Improvements in pumping machinery." Sept. 18, 1875.

3273.—DUNSTAN, J. Q., Falmouth, Cornwall, "Improvements in strainers for pump suction-pipes, and other pipes and apertures." Sept. 18, 1875.

3276.—BRAE, J. A., London, "Improvements in pumps, which improvements are also applicable to engines driven by steam or other fluid." Sept. 18, 1875.

3287.—ROWE, J. N., Rockland, U.S.A., "Improvements in pumps." Sept. 20, 1875.

3299.—KIDD, J., Westminster, London, "Improvements in vapour gas generators and burners." Sept. 21, 1875.

3301.—WESTON, F., Clapham Road, London, "Improvements in apparatus connected with increasing the illuminating power of coal gas." Sept. 21, 1875.

3303.—BELL, A. P., and THORP, T., Manchester, "A new and improved apparatus for lighting gas automatically." Sept. 21, 1875.

3305.—THORNYCROFT, J. I., Chiswick, London, "Improvements in pumping machinery actuated by steam or other fluid." Sept. 21, 1875.

3316.—BARTRUM, W. E., Streatham, London, "Improvements in rotary engines, pumps, or meters." Partly a communication. Sept. 22, 1875.

3317.—IMRAY, J., Southampton Buildings, London, "Improvements in gas-producing furnaces for boilers." A communication. Sept. 22, 1875.

GRANTS OF PROVISIONAL PROTECTION.

3048.—GOSLING, L., Kilburn, and GLUCKSTEIN, L., Westbourne Park, London, "Improvements in apparatus for lighting gaseliers or street-lamps." Aug. 31, 1875.

3058.—PINNINGTON, G., Liverpool, "Improvements in pumps." Aug. 31, 1875.

3102.—CARTER, H., Manchester, "Improvements in gas-fittings and burners." Sept. 4, 1875.

3162.—CLARK, A. M., Chancery Lane, London, "Improvements in treating sewage and other impure or polluted waters." A communication. Sept. 8, 1875.

3188.—SHANKS, A. F., Barrhead, Renfrew, "Improvements in and connected with water-closets, urinals, cisterns, baths, valves, and other apparatus in which water is consumed, contained, conveyed, or controlled." Sept. 11, 1875.

NOTICES TO PROCEED.

1816.—WALLACE, J., Durham, "A new and improved pump for pumping water, air, or gases." May 15, 1875.

1872.—BABLON, V., Paris, "Improvements in photometers or photo-phlogometers for measuring the intensity of the lighting power of gas in accordance with the size of the flame." May 21, 1875.

2842.—SUGG, W. T., Westminster, London, "Improvements in apparatus for the storeage and supply of gas." Aug. 12, 1875.

2880.—PATERSON, R. O., and BROTHERS, F. W., Cheltenham, "Improvements in obtaining salts of ammonia." Aug. 16, 1875.

2930.—STEEL, J., Glasgow, "Improvements in drawing retorts, and in the machinery or apparatus employed therefor." Aug. 20, 1875.

2986.—MALLINSON, J., Welwyn, Herts, "Improvements in cocks and in sluice and slide valves to regulate the flow of steam, water, and other fluids." Aug. 25, 1875.

3070.—LAKE, W. R., Southampton Buildings, London, "Improvements in liquid-meters, which may also be used as pumps or motor-engines." A communication. Sept. 1, 1875.

INVENTION PROTECTED FOR SIX MONTHS ON THE DEPOSIT OF COMPLETE SPECIFICATION.

3070.—LAKE, W. R., Southampton Buildings, London, "Improvements in liquid-meters, which may also be used as pumps or motor-engines." A communication. Sept. 1, 1875.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

1116.—NICHOLAS, J., Hope, Flint, "An improved method of and apparatus for carbonizing coal, slack, peat, wood, bones, and other like materials, subjected to a coking process or to destructive distillation, whereby commercial products are obtained and the vapours and gases utilized." March 27, 1875.

1120.—BROWN, M. H., New Cross, London, "Certain improvements in water-closets for deodorizing and disinfecting the same, applicable also for other places." March 27, 1875.

1194.—BABLON, V., Paris, "Improvements in apparatus for regulating the flow of lighting gas as well as for regulating the delivery of liquid and fluid substances of all kinds." April 2, 1875.

1277.—BARLOW, H. B., Manchester, "Improvements in engines for obtaining motive power and for pumping, partly applicable for converting a rotary motion into a rectilinear to-and-fro motion, and *vice versâ*." A communication. April 8, 1875.

1278.—BRAUN, O., Berlin, "A new method and a new machine for separating bodies of any kind from gases of any kind, by preference applicable for getting the useful substances out of the smoke of pit-coal." April 8, 1875.

1393.—BRAKELL, C., Manchester, "A new or improved engine for obtaining and applying motive power, applicable also as a fluid-meter, and apparatus or appliances in connexion therewith." April 16, 1875.

2518.—CANNING, Sir S., Great Winchester Street Buildings, and JOEL, H. F., Dalston, London, "Improvements in pneumatic signalling or communicating apparatus, and in the mode of and apparatus for testing the transmitting tubes for the same, applicable also to the testing of gas and other pipes or tubes." July 13, 1875.

2685.—REDWOOD, T. B., North Finchley, London, "Improvements in the manufacture of gas." July 29, 1875.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

2510.—VINCENT, W., "Improvements in apparatus for manufacturing gas." Aug. 23, 1872.

2538.—SCOTT, H. Y. D., "Improvements in the treatment of sewage, and in the preparation of manures therefrom." Aug. 26, 1872.

2569.—GERLAND, B. W., Ph.D., and JOHNSON, E., "Improvements in the manufacture of sanitary charcoal, and the application thereof to the treatment of sewage." Aug. 29, 1872.

2577.—JUDKINS, C., "Improvements in wet and dry gas-regulators." Aug. 30, 1872.

2587.—LAKE, W. R., "Improvements in electrical apparatus for lighting gas and other burners." Aug. 30, 1872.

2599.—EDWARDS, J., "Improvements in the manufacture of wrought-iron fittings or junction pieces for gas, steam, and water pipes." Sept. 2, 1872.

2602.—WOODHOUSE, S. J., "An improved apparatus for purifying and regulating the supply of gas to burners, also an improved construction of burner and standard tap to be used therewith, and for other purposes." Sept. 2, 1872.

2630.—POLLARD, J. W., SCHOFIELD, J., and BUTEL, A., "Improvements in the treatment of spent oxides of iron for the purpose of extracting cyanides." Sept. 4, 1872.

2711.—RUCK, W. D., "Improvements in the manufacture of gas." Sept. 12, 1872.

PATENT WHICH HAS BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

2780.—NEWTON, A. V., "An improvement in pumps." Sept. 9, 1868.

D. BRUCE PEEBLES & CO.,
ENGINEERS,
FOUNTAINBRIDGE WORKS, EDINBURGH,
MANUFACTURERS OF WET AND DRY GAS-METERS;
Patentees and Sole Manufacturers of PEEBLES' LAMP-GOVERNORS.
ABOVE 30,000 OF WHICH ARE NOW IN USE.
"These Lamp-Governors are so superior that they are likely to supplant all others."—*Dr. Wm. Wallace, F.R.S., F.C.S.*
D. BRUCE PEEBLES AND CO., FOUNTAINBRIDGE WORKS, EDINBURGH.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION has been AWARDED to

GWYNNE & BEALE'S PATENT IMPROVED GAS-EXHAUSTERS,

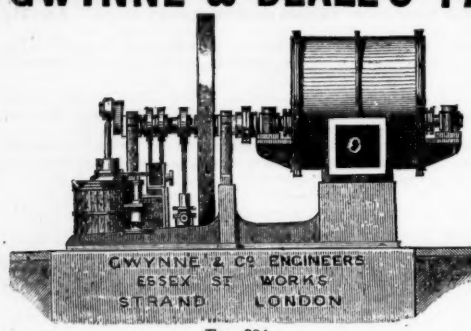

FIG. 224.

The BEST EXHAUSTERS IN THE WORLD.

Made under the personal superintendence of

Mr. BEALE,

The oldest Maker, Inventor and Patentee of

GAS-EXHAUSTING MACHINERY.

(It is NOT CORRECT to state that Mr. BEALE has RETIRED.)

Prices and every information on application.

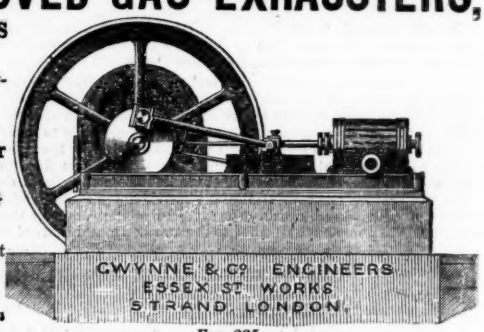

FIG. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. GWYNNE AND CO. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

REGULATORS, BYE-PASSES, STOP-VALVES, GAS-VALVES, & MACHINERY FOR GAS MANUFACTURE, OF ALL SIZES,
CAN BE HAD ON APPLICATION TO

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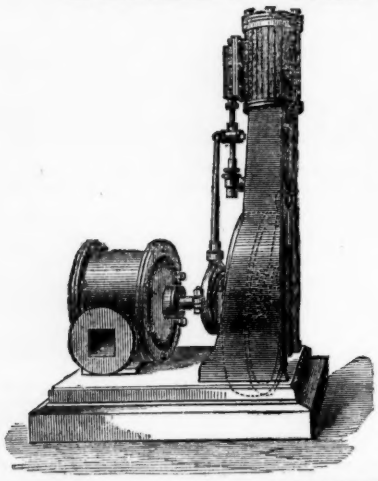
G. & Co. are now manufacturing for a London Gas Company three of their 210,000 cubic feet Patent Gas Exhausters, and many of all sizes.

BEALE'S IMPROVED PATENT GAS-EXHAUSTER



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ENGINE COMBINED

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SOLE MAKERS,

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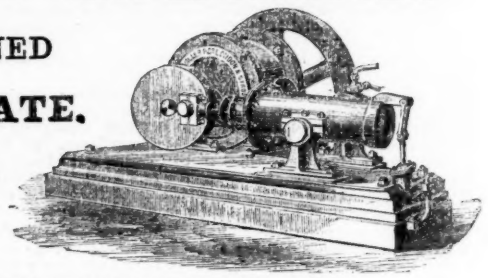
Who, since Mr. BEALE'S retirement, are the Oldest Makers.



EXHAUSTERS with HORIZONTAL ENGINE combined.
EXHAUSTERS with OUTSIDE BEARINGS.
MAKERS of ENGINES, BOILERS, and GAS MACHINERY.
TAR, LIQUOR, and SYPHON PUMPS. GAS-VALVES in stock, 2 to 30 inches.
SELF-ACTING BYE-PASS VALVES, with Lid and Relieving Lever.
MANN'S and many other descriptions of WATER DISTRIBUTORS.
SCRUBBERS, PURIFIERS, and CONDENSERS.
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PHŒNIX ENGINEERING WORKS, HOLLAND STREET, S.E., & at STROUD, GLOUCESTERSHIRE.

WANTED, a steady industrious Man as STOKER, &c.
Apply, stating wages, to Mr. T. SIMPSON, Gas-Works, DAVENTRY.

WANTED immediately, a young Man as SMITH, Main and Service Layer, to take Indices and Fix Meters. Wages 25s. per week.
Applications, with testimonials, to be sent to Mr. T. GILES, Gas-Works, West Cowes, ISLE OF WIGHT.

WANTED, a sober, steady, active FOREMAN for a Retort-House. Also a resident STOKER for a small country Gas-Work.
Applications, with testimonials, to be forwarded to Mr. E. GODDARD, Engineer, Gas-Works, IPSWICH.

WANTED, by a young Man, aged 27, a situation as METER INSPECTOR, or as Foreman Gas-Fitter. Has a first-class experience of gas-fitting in all its branches. Willing to make himself generally useful under the direction of the Engineer of a Company. Is respectably connected, and can give security if required. Good references.
Address No. 199, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a young Man, aged 23, a situation as ASSISTANT MANAGER, or as Clerk and Collector, or Meter Inspector. Well acquainted with keeping Gas Companies Accounts, and the collection of same. Can produce testimonials and references as to ability and character.
Address No. 204, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

NEW EDITION, NOW READY,

ADVANTAGES OF GAS FOR

COOKING AND HEATING.

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For Companies to issue to their Gas Consumers.

Specimen Copy by post Threepence, direct from MAGNUS OHREN, Gas-Works Lower Sydenham, London, S.E.

WANTED, the Management of a Gas-Work, where a day stoker is kept preferred. Understands engine and exhauster, laying mains, services, and fixing meters, &c.; or as an Assistant Manager of a large Gas-Work.
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WANTED, by the Advertiser, who has served his time as a gas-fitter, and has had 11 years experience as fitter in different Gas-Works, a situation as CLERK and Inspector in a Manager or Secretary's Office. Can write a good hand and give good references.
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WANTED, in a Gas Engineering Establishment, a practical mechanic, to act as FOREMAN. Accustomed to the manufacture of Engines, Exhausters, Valves, Pumps, &c. Good wages will be given to a first-class man, and none but first-class men need apply.
Address No. 205, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED immediately, at a large provincial Gas-Works, a NIGHT FOREMAN over the carbonizing department. Must be able to take the men's time and have had experience in a similar capacity. Good references indispensable. Wages 50s. per week of seven days.
Apply, by letter only, to No. 206, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TENDERS FOR GAS COAL.

THE Malvern Local Board are prepared to receive TENDERS for the supply of 500 tons of Kirkless Hall (Wigan), GAS COAL, to be delivered into their Gas-Works, at Great Malvern, on or before the 31st day of October next.
The lowest or any tender will not necessarily be accepted.
Tenders to be addressed, under cover, to the "Chairman of the Gas Committee, Local Board Offices, Malvern," and delivered at the Offices of the Board, at or before Ten o'clock in the forenoon of Tuesday, the 5th day of October next.
By order,
WM. WILKES CAWLEY, Clerk to the Board.
Malvern, Sept. 21, 1875.

WANTED, by the Advertiser, a re-engagement as MANAGER or Assistant. Has had 12 years practical experience in the manufacture and distribution of gas; also main and service laying, testing the illuminating power, &c. Good testimonials. No objection to go abroad.
Address No. 197, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, GAS-WORKS TO LEASE.

THE Engineer of a Work of acknowledged repute is desirous of LEASING a small work. Can offer unusual advantages to companies or proprietors whose undertakings are unremunerative, or have fallen into a dilapidated condition.
Address No. 202, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Llanelly Gaslight Company desire to secure the services of an experienced practical MANAGER, accustomed to the manufacture and distribution of gas. Present make 17 millions, rapidly increasing.
Apply, stating salary required, to Mr. JOHN POWELL, Secretary, Llanelly, SOUTH WALES.

STATION-METER, second-hand, for SALE, in good condition. Capable of passing 8000 feet per hour, together with bye-pass, valves, and connexions complete. To be sold to make room for a larger one.
Apply to Mr. C. TURNER, Manager, Gas-Works, Ravensthorpe, MIRFIELD.

FOR SALE—A Station-Meter, in good condition, with inlet, outlet, and bye-pass valves and connexions complete. To pass 10,000 cubic feet per hour. Erected by The Gas-Meter Company in 1864, now replaced by them with one of a larger size.
To be seen, and applications made, at the GAS-WORKS, Bromley, KENT.
Sept. 15, 1875.

G. A. BAILEY AND CO., Machinists, Manufacturers of all kinds of Indexes for Gas and Water Meters, Indicators, Tell-Tales for Turnstiles, on an improved principle. Every description of Wheel and Worm Cutting, &c.
86, Crampton Street, Newington Butts, LONDON, S.E.
N.B.—Country Orders executed with despatch.

C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

The improvements made during the past three or four years in all the parts of the internal and external construction and machinery of these Scrubbers have rendered them perfect for their work of purification with all kinds of coal, and their cost is less than any other method of completely purifying gas from ammonia.

They contain their own motive power, re- quiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

They are, in all cases, constructed under guarantees to perfectly perform their work. They are now extensively used in the largest gas-works of London and the chief cities of Europe, **nearly one hundred being in use,** and their perfect efficiency and profit to a gas company have been fully established with every variety of coal used in Europe. References can be given to the largest gas-works in Europe.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

CONDENSER, SCRUBBER, AND PURIFEIRS FOR SALE—A BARGAIN.

THE Directors of the Shanklin Gas and Coke Company, Limited, have on SALE the following APPARATUS:—

Two dry lime Purifiers, each 5 ft. by 4 ft. by 2 ft. 6 in. deep, with outlet-boxes, water-lutes, wrought-iron lids, T-iron bearers, cast-iron sieves, lid-lifting gear, 4-in. connecting-pipes, and dry centre change valve complete.

One Annular wrought-iron Condenser, 24 in. diameter and 9 ft. 6 in. high, with inner tube 18 in. diameter, and 4-in. connecting-pipes, fitted with cleaning-out doors.

One wrought-iron Scrubber, to match Condenser, 24 in. diameter and 9 ft. 6 in. high, with four tiers of cast-iron grids, cleaning-out doors, water distributor, tank, 4-in. connecting-pipes, bye-pass valve, &c., complete.

The apparatus is in good condition, and can be seen at the Gas-Works, Shanklin, Isle of Wight, and particulars as to price obtained from W. SUTHERLAND, Secretary.

Gas-Works, Shanklin, Sept. 20, 1875.

TO PIPE-LAYERS AND OTHERS.

THE Aberdare Local Board of Health are desirous of receiving TENDERS for the undermentioned WORKS, viz.—

CONTRACT No. 1.—The Laying of about 9000 lineal yards, more or less, of Main Pipes, from 5 in. to 3 in. diameter.

CONTRACT No. 2.—The Laying of about 11,495 lineal yards, more or less, of Distribution Piping, 3 in. and 4 in. in diameter.

Forms of specification and tender may be obtained on application to the undersigned, at the Offices of the Local Board, Town Hall, Aberdare, South Wales, or to the Engineer, J. F. Bateman, Esq., C.E., 16, Great George Street, Westminster.

Separate tenders will be required for each contract.

Tenders to be sent to me on or before the 6th day of October, 1875, endorsed, "Tender for Pipe-Laying, Contract No. —"

The Board do not bind themselves to accept the lowest or any tender.

R. ORTON GERY, Clerk to the Local Board.

MR. HODGSON JONES, Memb. Inst. Civil Engineers of London and of Paris, has REMOVED his Offices to 26, Great George Street, London, S.W., where he may be consulted on all questions relating to Gas and Water Works, Drainage, Sanitary Works and Estate Improvements.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

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HENRY LYON,

CONSULTING GAS ENGINEER,

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Cast-Iron PIPES and VALVES.

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Patent Pipe SCREWING-MACHINES, &c.

Mr. ALFRED LASS,

60, CORNHILL, LONDON, E.C.,

Is prepared to open the Books, and, if necessary, keep the Accounts of Gas and Water Companies.

To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.

To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

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We submit the above Burners to Managers of Gas Companies as being worth a recommendation to their consumers. Though the price is little more than that of common Burners, we believe them to be nearer perfection, for general use, than any others, however costly.

By an increasing number of important gas and railway companies they are used as being the best obtainable for general purposes, and have supplanted enormously costly burners, which give good results in the testing-room, but which fail of their effect when brought to the test of general use.

Dr. W. Wallace, F.R.S.E., F.C.S., Gas Examiner to the City of Glasgow, in a lecture on the "Economical Combustion of Coal Gas," delivered to the Philosophical Society of Glasgow in March, 1874, says: "These are the best Burners obtainable at moderate cost," and, after mentioning several other "good" Burners (which ranged in price up to thirty times the price of ours), he continues, "and their performance is no better than that of Bray's Burners."

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WOLSTON'S TORBAY IRON PAINTS.

THE Torbay and Dart Paint Company, Limited, 23, Great George Street, Westminster, S.W., having been informed that PAINTS not manufactured by them are being offered to Gas Companies and the public as "WOLSTON'S," hereby give notice that they will TAKE PROCEEDINGS against any persons infringing their rights as sole proprietors and manufacturers of Wolston's Torbay Iron Paints.

(See Advertisement on another page.

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The forms for this purpose are to illustrate the Paper on Distribution of Gas, read at the Edinburgh Meeting of the British Association of Gas Managers. By the use of the synopsis the whole of the out-door plant may at once be seen, with all matters pertaining to the same.

W. J. WARNER, Engineer.

South Shields.

IN THE MATTER OF BRONNER'S PATENT BURNERS.

NOTICE is Hereby Given that Julius Brönner, on the 20th of April, 1875, in a suit in Chancery, 1874, B 365, obtained an injunction perpetually restraining the Defendant, his Agents, Servants, and Workmen, from in any way advertising or offering for sale, or selling, or from in any manner causing to be advertised, or offered for sale, or sold as "Real Brönner," or "Brönner," or "Broehner" Burners, any Burner not manufactured by or for the Plaintiff, Julius Brönner, or by his Agents.

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Solicitors for the Plaintiff,

JULIUS BRÖNNER, Frankfort-on-Maine.

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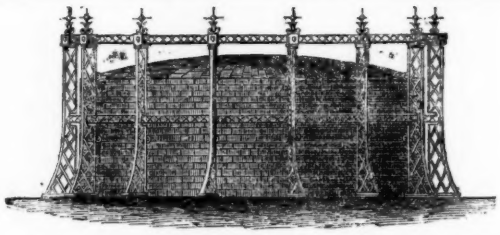

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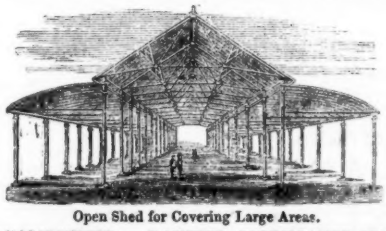

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(See Notice on another page.)

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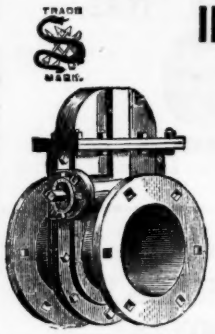

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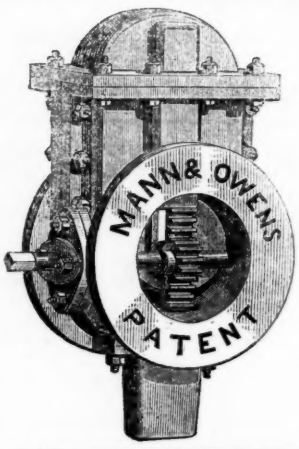

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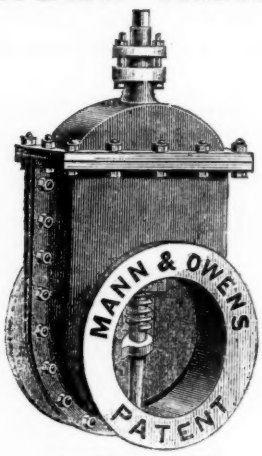

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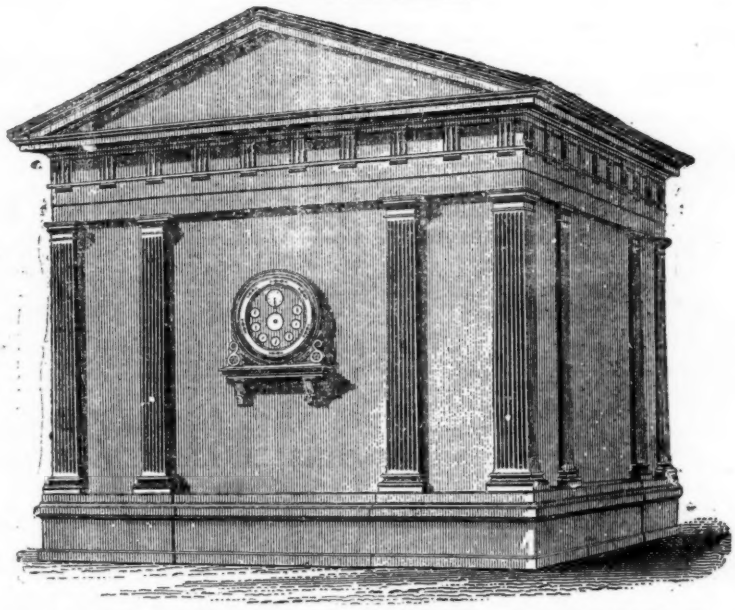

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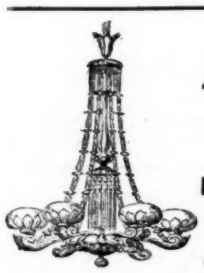

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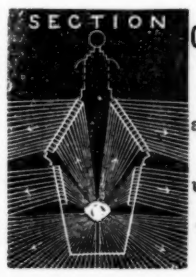

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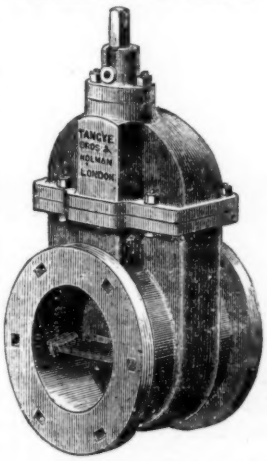

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This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 33-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.
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STRONGLY RECOMMEND A TRIAL OF THEIR
CELEBRATED SILKSTONE GAS NUTS.

Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·0	0·69

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.

APPLICATIONS FOR PRICES, &c., TO BE SENT DIRECT TO THE COLLIERY, AS ABOVE.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

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THE DERBYSHIRE

SILKSTONE COAL COMPANY, LIMITED,

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GAS COAL

Of superior quality, delivered at any station in England and Wales.

Purified gas per ton of coal in cubic feet (average)	10,775
Weight of coke in lbs. per ton of coal	1,465

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Works: LOCHORE by LOCHGELLY, FIFESHIRE. Office: 19, MAITLAND STREET, EDINBURGH.

This Company request attention to the very superior quality of their Cannel Coals.

1. The following are the practical results given by Dr. Wallace, of Glasgow, of analyses of their Lochore and Capledrae Cannels:—

	Sample worked at Capledrae.	Sample worked at Lochore
Gas per ton of coal, at 60° Fahr. and 30 inches barometric pressure . .	13,095 cubic feet.	11,760 cubic feet.
Illuminating power, in standard sperm candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	32·91	34·83
Value of 1 cubic foot of gas in grains of sperm	780	836
Equivalent of a ton of coal in pounds of sperm candles	1,459	1,404
Durability of 1 cubic foot by 5-inch flame	69 minutes.	71 minutes.
Gravity of the gas (air = 1000)	596	594

Remarks.—This (the sample from Capledrae) is a Cannel Coal of first-class quality, giving 13,000 feet of 33-candle gas. It contains only a minute proportion of sulphur, and the ash is almost quite white. The coke is of rather inferior quality.

Remarks on Sample from Lochore.—This is a Cannel Coal of first-class quality, giving a large yield of very rich gas and a coke of medium quality.

2. The following are the practical results of analyses by Dr. Wallace of the Company's Waverley Cannels:—

	Capledrae Waverley.	Lochore Waverley.
Gas per ton of coal, at 60° Fahr. and 30 inches barometer	9,120 cubic feet.	11,145 cubic feet.
Illuminating power, in standard candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	36·62	33·09
Value of 1 cubic foot of gas in grains of sperm	878	794
Equivalent of a ton of coal in pounds of sperm candles	1,145	1,264
Durability of 1 cubic foot of gas by 5-inch flame	80 minutes.	67 minutes.
Gravity of the gas (air = 1000)	677	597

Remarks on the Sample of Capledrae Waverley.—This Coal gives fully 9000 feet of gas of 36½ candles, and is admirably adapted for bringing up the quality of gas made from common coal or inferior qualities of cannel. The tests were made at a rather high temperature, this being one of the coals that stand a very high heat without serious diminution of the illuminating power of the gas The coke contains 60 per cent. of ash, and is therefore almost valueless, but the proportion of sulphur is very moderate.

Remarks on the Lochore Waverley.—This is a first-class Cannel Coal, giving 11,000 cubic feet of 33-candle gas. The quantity of sulphur is very minute, and the ash is nearly white. The coke is of inferior quality, but not wholly valueless.

Applications for full Copies of Analyses and Prices may be made to the Company, at

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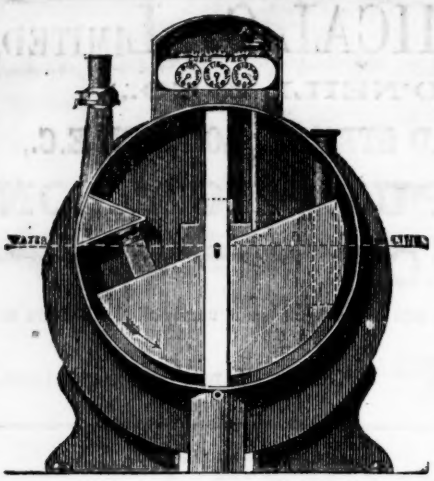

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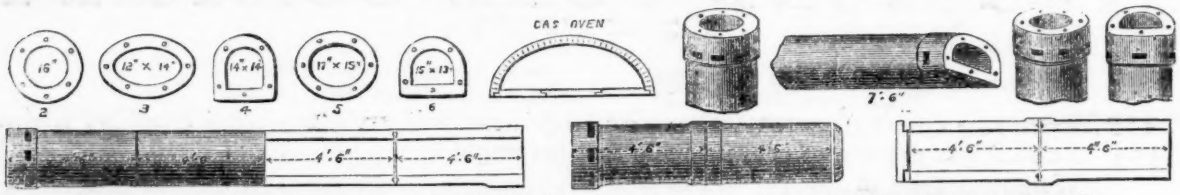

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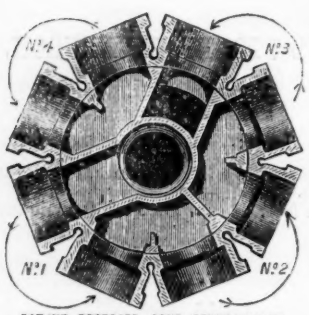

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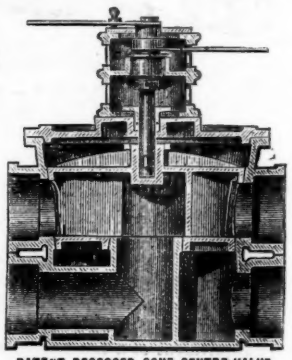

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